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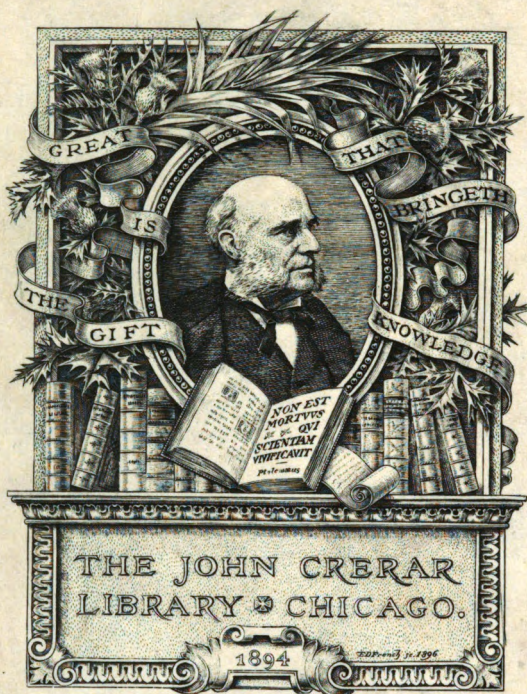


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The American Poultry School

Kansas City, Missouri

*"The Quisenberry Way
Makes Every Hen Pay"*



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LESSONS NOS. 26 & 27 POULTRY DISEASES

Their Causes, Prevention and Cure

GENERAL COURSE IN POULTRY HUSBANDRY

Copyright, 1922
BY THE AMERICAN POULTRY SCHOOL
T. E. QUISENBERRY, President

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Notice to the Student

IF you wish information concerning your individual poultry problems, or concerning facts contained in the lessons, such questions should be asked in personal letters rather than mixed in with your answers to the examination questions. This will eliminate the danger of your questions being accidentally overlooked and the resulting dissatisfaction on your part because of imagined lack of service or interest in your personal problems. Therefore, we would again request that you ask all questions in personally written letters, which you may enclose with your examination papers, if you so desire. Always give your student number at beginning of every lesson or letter. We make this request for your satisfaction and for your own good.

READ THIS ADVICE THREE TIMES

IN answering the examination questions, first get some medium priced, light weight bond paper, 8½ by 14 inches. We will furnish 100 sheets and 25 envelopes for \$1.00, if you are unable to secure it at your own home. This paper will save both YOU and US considerable postage. Place your NAME, ADDRESS, STUDENT NUMBER, and the SUBJECT of the lesson at the beginning of the first page. Handle only one lesson at a time. If this book contains two lessons, divide your answers just as the questions are divided, but send both examinations in together. Do not write out the questions. Simply number your answers to correspond to the questions. Do not include personal questions with your lessons. If you desire information about any particular thing, write us a separate letter and it will go direct to our personal aid department.

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Respectfully,

T. E. QUISENBERRY, President.

Kansas City, Missouri.

POULTRY DISEASES

Their Cause, Prevention and Cure

By T. E. QUISENBERRY

Copyright, 1922

The poultry industry has outgrown its swaddling clothes and towers as a giant among the agricultural pursuits of the world. It is not today a mere side issue, but has become one of the specialty lines of farm pursuits. Exclusive poultry farms are being established rapidly, with greater promise than ever before of success, because of the progress that science has made in combating disease. So great is the importance of poultry work that many States are supporting poultry departments for research, that the causes of disease and methods of combating them may be found.

No doubt you have heard of Lady Show You, the bird that sold for eight hundred dollars. If Lady Show You should catch a cold or contract disease of any kind, that would be of some concern to the owner. The increasing value of birds has led to greater interest in trying to ascertain the cause of disease and the methods of combating it. Poultrymen, however, are following the leadership of the modern physician, who is laying greater stress upon preventive methods than upon faith in curative agencies.

Fowls, like men, have become heir to more diseases under civilizing agencies than when they roamed the wilds and made their own way. The man who argues that the farm fowl that roosts in the trees and hunts its own way has more vigor than the pampered bird, has the better of the argument. That type never produced a Lady Show You, or a bird like her, however. They have maximum health, but give minimum results in egg production.

Modern methods have brought disease. Fowls have the gout, rheumatism, colds, pneumonia, tuberculosis and many of the diseases that civilized man has, and new diseases are constantly appearing that baffle poultrymen. The interchange of birds through the country scatters disease, and it is not often that trouble is localized, as it soon becomes a problem for the entire poultry world.

In breeding for high egg production or show qualities it is well to build for health and vigor at the same time and not permit disease to make inroads into your flock. The time is at hand when we should devote more attention to the scientific study of poultry diseases and breed vigor into the flock, not disease. It is important that the veterinarian should know something of poultry diseases, that the poultrymen may have a specialist to treat his fine birds or to give professional advice in handling of his flock. The place to study poultry diseases with a view to finding methods of combating and curing them is the Experiment Station. It is the duty of every farmer and every professional poultryman to learn to diagnose disease and the methods of treatment. It is well to learn how to make post-mortem examinations in order to furnish to your Station or the Federal department at Washington a description of the disease that was the cause of the death of the birds. We illustrate to you how to do this, so that if you are not familiar with the trouble you will be able to give a more detailed description of the disease that caused the death of your bird than is ordinarily given in letters to the stations.

In many cases by using this book as a guide you will be able to find the trouble, diagnose the disease and then apply the remedy.

PREVENTION RATHER THAN CURE

You should aim to prevent the occurrence of disease rather than to cure it. Unless the fowl be a valuable specimen, it seldom pays to doctor it, for any really serious ailment. It is all right to give treatment when beneficial results can be obtained by applying treatment to the whole flock, but otherwise it seldom pays. A cured chicken is a menace to the flock and its weakness is more or less certain to appear in the offspring.

Wright sums up this point very well as follows: "In a large proportion of cases of disease, the birds ought to die or to be killed. Even where there is no constitutional taint, the fact that they have succumbed to circumstances which have not affected others, marks them as the weakest, which, unaided, nature would assuredly weed out, and which, if we preserve and breed from, would perpetuate some amount of that weakness in the progeny. Rheumatism, for instance, can be cured; of that there is no doubt. But the vast majority who have had such success agree that the effects are either never recovered from, or retards strength and vigor, or else that the original weakness continues; and the same may be said of some severe contagious diseases, such as diphtheretic roup, which may affect the strongest. On the other hand, many diseases also apparently contagious, and so attacking healthy birds under certain predisposing conditions of exposure or other coincident strain upon the system, do not appear to leave serious results behind them, and are quite definite in symptoms and character. It is these which may be most successfully treated, and in which treatment is most worth while where fowls of value are concerned. But it is significant that nearly all breeders who raise really large numbers of poultry gradually come to the conclusion that with valuable birds the most economic treatment of serious diseases occurring in a yard, except in specific cases, is execution. A sick bird indicates that something is wrong, so treatment of the flock should begin at once."

THE ESSENTIALS TOWARD PREVENTION

You may sum up the essentials of poultry hygiene as follows:

1. Clean up.
2. Clean out.
3. Clean houses.
4. Clean air.
5. Clean food.
6. Clean water.
7. Clean yards and clean range.
8. Clean incubators and brooders.
9. Clean birds outside and inside.

A GREAT PREVENTIVE

You can keep your birds in a healthier state and prevent many diseases if you will keep their systems cleaned out by giving one-third to one-half teaspoonful of Epsom salts to each bird every month. We dissolve the salts in water and moisten a mash made of bran, middlings, and cornmeal, with the water containing the salts. During the breeding season we give the salts once every two weeks. This method will add much to the general health of your flock, and we advise all farmers and poultrymen not to neglect this important preventive.

HOW MUCH EPSOM SALTS TO GIVE CHICKENS

For chicks from one to five weeks old, one level teaspoonful to eight chicks.

For chicks from five to ten weeks old, one level teaspoonful to five chicks.

For chicks from ten to fifteen weeks old, one level teaspoonful to three chicks.

For chicks from fifteen to twenty-six weeks old, one level teaspoonful to two chicks.

For adult fowls, as a preventive, one-half to three-fourths of a teaspoonful each every two weeks.

For adult fowls, as a cure, three-fourths of a teaspoonful each.

Salts may be given most conveniently when dissolved in water and mixed with a little mash.

It is best to starve the fowls for about one or two meals before feeding the salts.

TRAIN YOUR EYE TO DETECT DISEASES

One of the worst troubles of many who assert that they are expert poultrymen, and who are apparently very careful and very much interested in their work, is that they are unable to detect disease in its first symptoms, the time when it is most easily overcome and remedied. We find that a very

small per cent of poultry raisers are able to detect disease in its first form, and they do not know, or fail to realize, when the birds first show symptoms of being out of condition. Any one can readily tell that something is wrong when one eye of the bird is swollen shut, when it is unable to walk or when its feathers are soiled by a bloody diarrhea discharge. The real poultryman will discover these troubles in time and will attempt to remedy them long before the birds reach this unfortunate condition. Segregation of the sick fowls before they have had an opportunity to spread the contagion among the whole flock will be his aim. If you desire to succeed as a poultryman, it will pay you to train your eye to detect disease and to know when your fowls show the least sign of being out of condition.

A sick fowl usually sits humped up, with its head and neck drawn back close to its body or down into its feathers. It remains quiet and does not move about unless disturbed and then moves slowly or unnatural. The feathers are usually ruffed up and stand out from the body. The eyes are often closed and present a sleepy appearance. The comb and wattles will either be dark or very pale. If the bird shows any of these symptoms, examine it, and either isolate it or keep your eye on it for future developments.

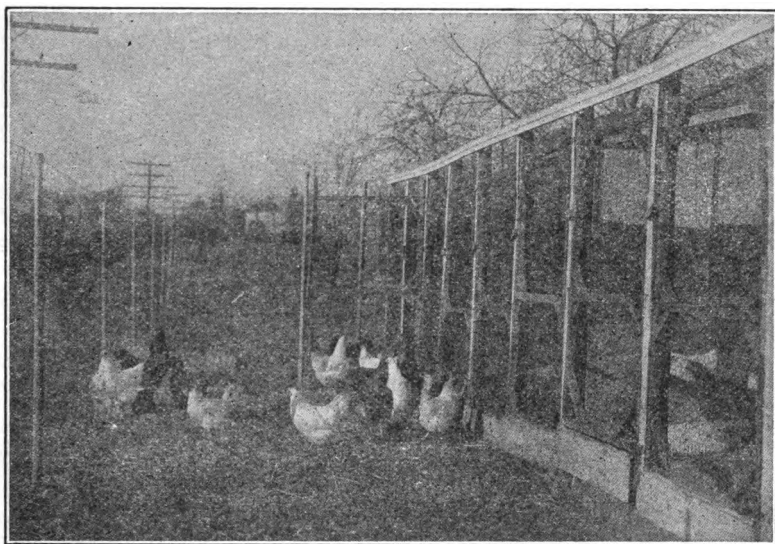


Fig. 1.

A view of a hospital and a pen of healthy birds which were compelled to live in front of it for a period of several months to ascertain whether or not they would contract any of the diseases.

Above is a picture of the hospital and the attendant's passageway in front, which is on the south side of the hospital. The straw, or litter, from the sick birds is scratched out at the front from each room or ward into this passageway.

Ten healthy, vigorous hens and one cockerel were allowed to run in this space in front of the hospital. The litter which came from the sick birds was their favorite scratching place. They were kept there for three months with no sign of contracting any of the diseases.

The reason was, no doubt, that the rooms faced the south and received an abundance of sunlight and fresh air, which destroyed the disease germs. So we believe that Nature's own remedy and preventive should be made use of by every poultryman. The importance and the value of fresh air and sunlight are recognized by all medical authorities. Disease germs cannot live long where these two atmospheric conditions exist. This, with a good

healthy, vigorous flock, strong in natural immunity, will do more towards eliminating diseases than all the medical assistance one can give.

BREEDING AND HEALTH

We know of no sounder advice on this subject than that contained in an article of Dr. Prince T. Woods, in the American Poultry Journal, as follows:

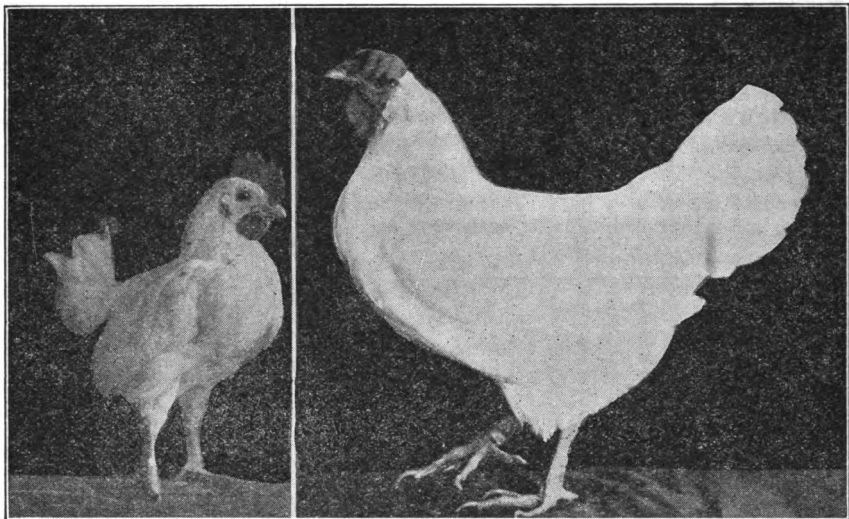


Fig. 2.

A hen of high vitality and her seven-weeks-old son of high vitality that crowed at seven weeks of age.

"THE HEALTH TYPE.—For all practical purposes, the type of health and strength and the type of weakness, of lacking bodily vigor, are easily differentiated. Do not mistake the purely nervous energy of closely bred thoroughbreds for an indication of vigor. This may be simply the mettlesome spirit of the thoroughbred, and combined with satisfactory physical qualities it is a desirable asset."

"CHOOSING THE MALE BIRD.—Always bear in mind that the male bird is half of the flock. The male should be a fully matured, well developed specimen, neither too old nor too young. A male bird from twelve months to two and one-half years old usually makes the best breeder. He should be of sound, healthy parents and should, as far as possible, inherit from them the qualities which are desired for chicks of his get. He should be particularly strong in all points of physical vigor and of standard requirements, where his mates show any traces of weakness. Have him as nearly perfect in standard shape as possible, of medium size and weight for the variety. Too heavy males often seriously injure their mates and are not desirable in the breeding pen.

"The head should be rather large, broad and of good shape, well carried. The eye should be bright, round and full, with no irregularities in shape of pupil. The comb, face and wattles should be a good, healthy color, neither too pale nor too dark. The beak should be rather short, stout and set well at the base. The long flattened beak of the 'crow-headed' birds or the misshapen 'hawk bill' are almost certain signs of physical weakness. The neck should be of medium length for the variety and rather full; the long, thin, 'scrawny' neck goes with the 'crow-head.'

"The body should be well filled out and carried in the well-set-up manner indicative of a well-ordered system of nutrition—a good digestion. The plumage should be bright, lustrous and carried rather close for the variety.

"Mopy, dopy, loosely feather birds with dull plumage and a listless 'don't care for life' manner are too short on good health to be of value as breeding stock.

"The legs should be medium short for the variety, strong and rather large boned and set well apart. The keel bone should be firm and straight. There should be no deformities.

"Leggy birds, knock-kneed and with crooked breastbones, are always lacking in physical vigor even if it does not show on the surface.

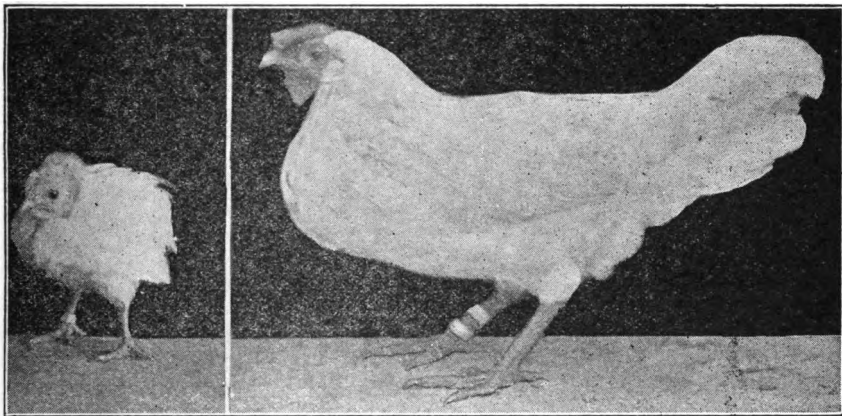


Fig. 3.

A hen of low vitality and her seven-weeks-old son that never lived to crow.

"The male should be attentive and gallant to his mates; should have a clear, lusty crow, free from any rattle at the end. He should be sound in wind and able to fight or run without shortness of breath or livid appearance of face and comb."

In selecting the profitable birds be sure to choose those with short toe-nails as they are the active, industrious, energetic birds which are always busy and keep their nails worn off. No. 1 shows an active, energetic hen which laid 217 eggs in one year, while No. 2 laid only 13. Note the difference in the nails.

CURED BIRDS WHICH ARE GOOD FOR FUTURE USE

There are some diseases which, if contracted by a bird, will prevent the bird's usefulness in a breeding pen, but in other cases the bird may be used if it recovers properly.

Birds which have had roup, tuberculosis or white diarrhea should never be permitted to enter a breeding pen, while birds with slight colds, or mild cases of chickenpox and canker, or bumble foot or other troubles which do not impair the vitality of the specimen can be used as breeders. Birds which have frozen combs, broken shanks, broken wings, etc., are good to use in a breeding pen if they have recovered properly.

The diseases mentioned may not be transmitted from parent to offspring, yet they indicate a weakness. If a bird happens to get a leg broken and recovers rapidly, without other complications setting in, the indications are that it has constitutional vigor. If the bird is good in other points, the fact that the leg was broken need not prevent its being used in your best breeding pens.

DAMPNESS SHOULD BE AVOIDED

A chicken cannot sweat, as it has no sweat glands in the skin, so most of the moisture has to be carried out through the breath. The amount of moisture the breath is able to carry off depends upon the amount there is in the air when taken into the lungs. For this reason, if no other, the poultry house should not be in a low, damp, foggy place. The fact that a bird cannot sweat and is forced to pass moisture off through the breath

sometimes overtaxes the respiratory organs and makes the bird more susceptible to colds and roup.

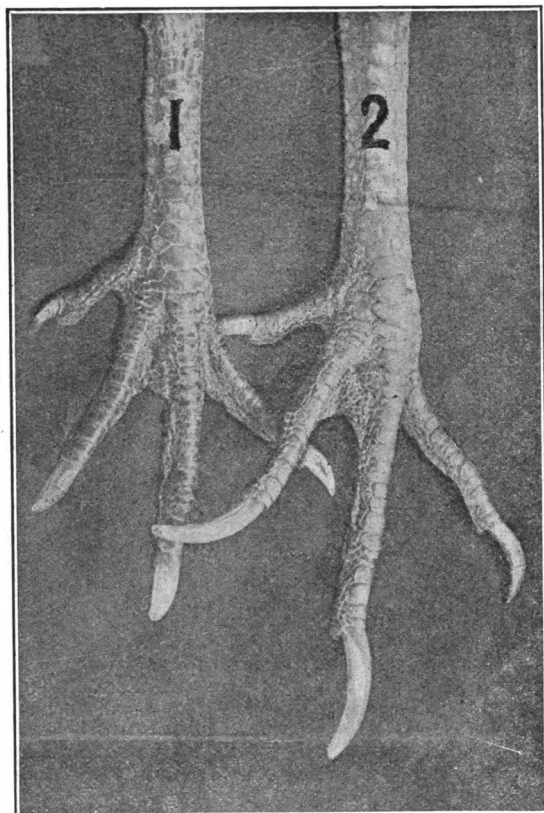


Fig. 4.

No. 1.—Foot from hen of high vitality; laid 217 eggs in one year. Note the short toenails, worn by activity of hen. No. 2.—Foot from hen of low vitality; laid 13 eggs in one year. Note the long toenails. Hen was inactive.

Dampness should be avoided. We find that a great many of the complaints and inquiries about disease which come to us are the direct result of fowls being kept in damp houses that are situated in low, flat, damp places. The house should be on a well-drained piece of land and should have sufficient foundation to raise the floor higher than the ground.

During rainy weather chickens like to get off the ground by flying to the woodpile, the fence, a pile of brush, or anything of similar nature which is off the ground. It is a good scheme to build an outside rest and shade combined. You can do this by using several poles placed closely together about three feet above the ground, just as if you were making a floor.

POULTRY HOUSES

A chicken spends more than half of its time in the poultry house, so of course the house is very important and has a great influence upon the health

of the bird. Some of the points to be looked after closely are location, size, ventilation, lighting and sanitation.

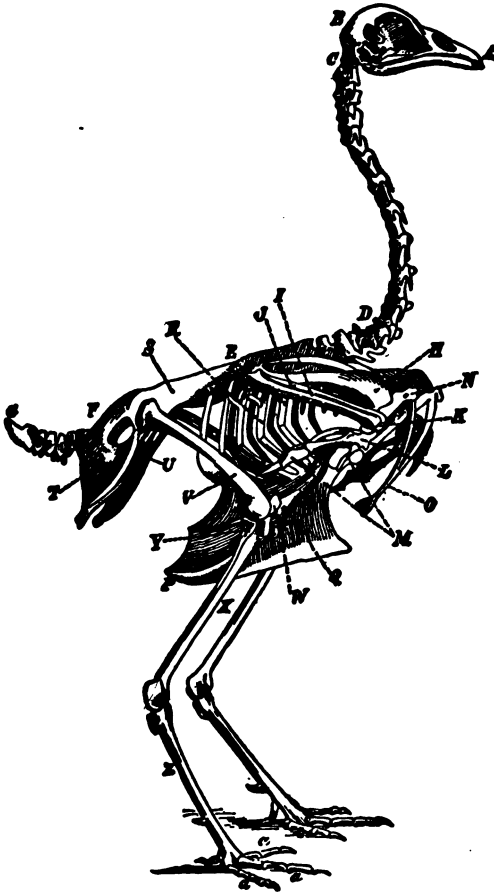


Fig. 5.

A, beak and jaws; B, skull; C to D, neck vertebrae; EE, backbone and ribs; F, acetabulum; G, pygostyle or tail bones; H, humerus; I, ulna; J, radius; K and L, bones of forewing; M, digits; N, scapula; O, clavicles (wish bone); P, breastbone or sternum; T and U, ischium and the extreme points of this bone are called the pelvic bones or lay bones; V, femur; X, tibia; Z, tarsometatarsus; a, toes.

LOCATION.—The proper location of the poultry house is of prime importance. No matter how good your house may be, if it is in a low, damp place, where the ward surrounding it is wet and the land sour, your house cannot overcome all of these evils. It should be placed upon high, well-drained ground. We prefer sandy, gravelly or light porous soil. Heavy clay soils should be avoided. They are hard to keep in a sanitary condition. If the ground does not drain well, do not erect a poultry house on it until you have provided for under-drainage by means of tile or open ditches. Water should never be allowed to stand in the poultry yards. A wet soil is colder than a dry one. Muddy feet cause dirty eggs, and dirty eggs must be washed, which lowers the price. Dampness breeds colds, catarrh, roup, rheumatism, pneumonia and tuberculosis. Air drainage is also very important.

Never locate the poultry house in a low, flat place where the air is always damp. Face the house to the south and, if possible, protect it on the north and west by trees, which act as a wind-break. The ground on which the house is situated should slope to the south or east.

VENTILATION.—A bird's normal temperature ranges from 106 to 107.5 degrees. In order to maintain this high temperature it is necessary to have an abundant supply of oxygen. Where there is so much combustion there is a great waste to be carried out through the breath. Hence the necessity for supplying plenty of fresh air.

Modern poultrymen have abandoned the old idea of supplying both light and air by means of glass windows. Glass windows admit light and keep out the rain and snow, while the best ventilator is made of slats sloping at about an angle of forty-five degrees, as in the cupolas of barns or the old-time window shutters, which admit air but exclude rain and snow.

LIGHT.—The house should be so arranged that sunlight will reach nearly all parts of the floor. Light and sunlight are the best disease exterminators, as the direct rays of the sun kill most disease germs. Do not make the error of putting in a great many glass windows in the poultry house and make no provision for the heat getting out. Too much glass is as bad as not enough. It makes a house cold at night and hot in the daytime.

There should be no dark corners. The hens always scratch from the light toward the dark, so they can see their food, and if there are dark corners they will bank the litter in these dark places, where it molds and forms an excellent place for disease germs to gather.

Sanitation is of great importance, and in order to keep the poultry house sanitary, bear this in mind when constructing a poultry house, as it is one of the most important points. Make it as simple as possible, so that it can be cleaned out and disinfected thoroughly without having to move so many boxes, barrels, boards and rubbish of all kinds.

CLEANLINESS.—"Cleanliness is next to godliness" in all things, and applies to poultry as well as anything else. But CLEAN in this case does not mean free from dirt or soil; for on the soil is the real home of the chicken; yet it should be free from disease and contaminated filth of whatever nature.

Some who will pay little or no attention to the cleanliness of their houses, brooders, incubators, etc., do succeed for a time, but depend upon it, their days of success are numbered. See that everything is subjected to a thorough cleaning and disinfection at least two or three times a year. By thoroughly cleaning we mean to clean out the litter, to shovel out the dirt and droppings, then to sweep the floors, walls and ceiling. We also like to have the nests, roost poles, feed boxes and hoppers so arranged that they may be removed from the houses, thoroughly cleaned, and new nests made before replacing. If you have a water hose convenient, turn it upon the floor, walls and ceiling and loosen all dirt. Take your shovel or hoe, scrape this all from the floor and again turn the water on. Let the house dry out for a day or two, then sprinkle the floor and walls with a solution of some disinfectant like zenoleum, creolin, etc. The nests and roost poles should be similarly treated. If there has been any disease in the house we would advise the application of the disinfectant the second time before putting the birds in. Keep the roost poles painted with a liquid lice killer or with some of your own make. Use one part crude carbolic acid and two parts kerosene.

HOUSING

The right sort of housing is absolutely necessary. If your houses are wrong, you have trouble to begin with. Your houses must be dry, comfortable, well ventilated and well lighted. Without these essentials, you are certain to have more or less trouble with disease and you are certain to become discouraged sooner or later.

THE FEEDS

The condition of any animal depends greatly upon the quantity and quality of the food it eats.

The different tissues of the hen's body require different elements to keep

that particular tissue properly nourished. If an animal eats to excess any one food, it gorges that particular tissue of the body while another part is lacking. In such cases, both parts are weakened and subject to disease. Over-feeding is almost as bad as under-feeding. Over-fat birds are as subject to disease as are poor birds. If the feed ration is properly balanced and properly fed there will be no danger of either condition mentioned.

CLEAN LITTER

The old saying that "a busy hen is a laying hen" should be reversed to read "a laying hen is always busy." Clean litter should be provided for the scratching shed, so the hens may scratch whenever they wish. Musty, dirty or moldy straw should not be used, nor straw that is ground up too fine, as the hens in picking out the grain in very fine litter are apt to eat so much fiber that it cannot pass from the crop to the gizzard. This is one of the causes of crop-bound. Some molds are very injurious to the health of chickens, so we should be careful about allowing the litter to get moldy.

HOPPERS AND FEED TROUGHS

A hen always supplies her bodily needs before she provides a surplus to form eggs. In order to supply food for the body and a surplus for eggs it must be worked into digestible form by the digestive organs. It is of vital importance that the food be clean, wholesome, nourishing and free from disease. It is a bad practice to feed chickens on disease-infected ground. It is far better to have a trough or feed hopper, which can be scalded when necessary.

Feed hoppers and drinking fountains are as necessary for small chicks as for large ones. They should be arranged so the chicks will not get into them, as they will contaminate both feed and water, besides getting wet.

FEEDING

The methods of feeding have as much to do with the health of the flock as the kinds of feed. In order that a chicken may be in the best of health it should be a continuous eater; in other words, eat small quantities often instead of eating a large quantity, then wait some time and eat more. The stomach of a fowl is small compared with the quantity of food consumed. As the food passes from the crop to the gizzard it receives the gastric juices from the stomach (or proventriculus). If the food is hurried through this part of the digestive tract it does not receive enough of the gastric juice, so the process of digestion is incomplete.

If fed by the hopper method or in troughs, there is not so much danger of contamination as if fed on the ground. Never feed a wet mash on the ground floor of a poultry house. And never feed more wet mash at any one time than the birds will clean up, as it will sour and probably cause indigestion.

NECESSITY FOR THE STUDY OF DISEASES

He who says he can always detect diseases by sight and smell has over-estimated his ability. The microscope will tell very closely, but, even then, you may have two diseases combined. The thing to do is to treat the chicken and place it in quarantine. Don't place it in with other sick chickens suffering from a different disease.

The general chicken raiser, and even the men at the head of large poultry farms, have been careless in regard to getting down to a system in studying diseases. Take the chickens that die and place them on a board, open them and learn all you can about them. You can save others by so doing. You can give more intelligent history to the bacteriological and pathological laboratories, and they in turn can help you stamp out the disease. Furthermore, there is no reason why you, yourself, should not find out something new that would be a help to the poultry world. If every farmer or poultry raiser would post all chickens that die and report the causes of death to the experiment stations we would find, in the first place, what diseases were causing the greatest loss of poultry. In some cases we would find out why, and how to stop it.

This is not all done easily, but it is done slowly and by good hard work; and there is some little danger to yourself by carelessness in handling

these birds. Some poultry diseases are infectious to man. For that reason your attention is directed to the fact that in treating roup and canker you should be careful. Germ diseases are like electricity—the better you know

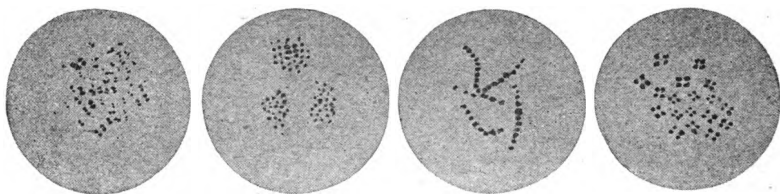


Fig. 6.

Bacteria as seen by the microscope. From left to right they are as follows: Diplococci, Staphylococci, Steptococci, Tetrads.

how to handle them the more harmless they are. Disinfect your hands after handling sick birds. Do not breathe directly over the mouth of a sick bird. Wear an old coat when handling diseased birds, and hang it in the sun when through with it. Formerly that was all that was done by physicians when

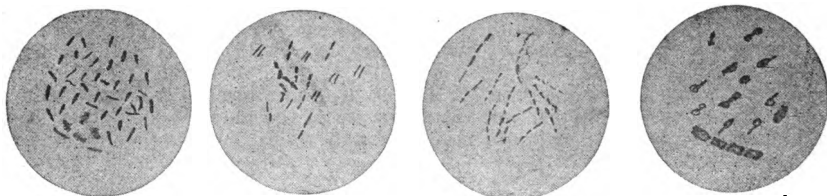


Fig. 7.

Bacteria as seen by the microscope. From left to right they are as follows: Single Bacilli, Diplo-bacilli in pairs, Strepto bacilli or threads, Spores.

carrying for contagious diseases. Today we have in addition more of the vaccines to protect man from diseases. As the poultry industry grows and the people learn the importance of it, and the value of the high scoring birds, the more the fowls will be treated for disease. Protection and prevention will be the treatment.



Fig. 8.

Bacteria as seen by the Microscope. Both are Spirillum.

THE BATTLE OF CELLS AND GERMS

There is a constant battle of the germs of the body and germ life, either directly by the germ entering or trying to enter and live in the cell or indirectly by germs producing poisons, and these poisons tend to break down the protoplasm that forms the cell. Yet we must not think that all germs or bacteria or microbes are detrimental to cell life. In fact, the greater number of bacteria are a benefit and aid plant life in its growth, and then aid in transforming plant life into animal food. The pathogenic bacteria and germs are the ones which produce disease and break down the cells.

The blood, in the first place, comes to the aid of the body cells in fighting disease germs and their toxins. It is the white blood corpuscles which are called the scavengers of the body. They take up bacteria in the blood stream or pass out of the blood vessels and there take up bacteria and die or

may pass back into the blood stream again and are carried away through some other organ. The composition of the blood serum itself has a certain neutralizing power for bacteria toxins and even disintegrates bacteria. The latter condition is aided by antitoxins and vaccines. Individuals once having had certain diseases are immune to them. This is true only in a few cases. How far this fact may be carried in poultry diseases is, as yet, unknown. The blood tests that are now being made will soon, we hope, determine the resisting power of the blood in fowls.



Fig. 9.
Colonies of Bacteria in Petridishes.

The conditions that determine whether or not a microbe can bring about infection are many. First is age. Experiments have taught us that while the adults of certain animals are very resistant to some germs, the young in some species succumb to the infection. Pigeons kept on a diet and without water just before or immediately after infection with anthrax germs rapidly take the disease and die, while in normal circumstances and conditions they are highly resistant to the disease. Other animals lose their resistance in the same way. Exposure to extreme cold or heat lowers the resistance, as is proved by the prevalence of pneumonia during the coldest part of the year when man is exposed to the changes in the weather.

An unsuitable diet, as the substitution of bread and milk for meat, does not supply the wants of certain cells or organs of the body, and hence they begin to degenerate and make it possible for microbes to attack the cells.

Bacteria also have a peculiar selection for certain organs or secretions, and these cells or secretions are modified by conditions before mentioned. These bacteria, if present, make their selection in the tissues most suitable for their growth. Diphtheria selects the tonsils, typhoid fever the gland of the intestine and pneumonia the lungs.

The power the body has of voiding off disease, of neutralizing toxins, or disintegrating bacteria is manufactured or produced in the cells and then given to the blood to a certain extent. It is learned that when antitoxin is injected into the blood it does not remain there very long. It has been discovered also that when toxins are mixed with blood only a part is neutralized, yet when the same amount is mixed with tissue cells it is all neutralized. There is something there that stimulates the cells to give up or produce more of this antitoxin or neutralizing material at times. They can be stimulated by injecting very small amounts of bacterial toxins and gradually increased, until large amounts of the toxins can be injected without effect. There are also different kinds of anti-toxins produced by the cells; for diphtheria anti-toxin does not protect the body from smallpox, nor typhoid fever vaccine protect against pneumonia. The cells manufacture a new anti-toxin for each disease.

ACQUIRED AND INHERITED DISEASE

When speaking of the origin of disease as a rule it is said to be either inherited or acquired.

When inherited the nucleus of the disease or original cause of the disease must be started in embryonic life. This nucleus must be transferred to the embryo by the parents.

At the present day the trend of opinion is that the weakened tendency to the disease is transmitted from parent to offspring, and, if an infectious disease, the infection takes place after birth. For example, enlarged tonsils

may be found generation after generation in children, and enlarged tonsils are usually diseased or may easily become diseased.

In fowls, disease germs are more apt to be transferred from the hen to the chick than is the case with mammals or the human race. When the ovule leaves its follicle there are still several layers of material to be placed about it before it is expelled. This tract, through which the egg passes and is built up, opens directly into the cloaca. This latter harbors a great many bacteria and these are capable of getting back into the oviduct just as well as the spermatozoon. These germs may be enveloped in the egg before it is

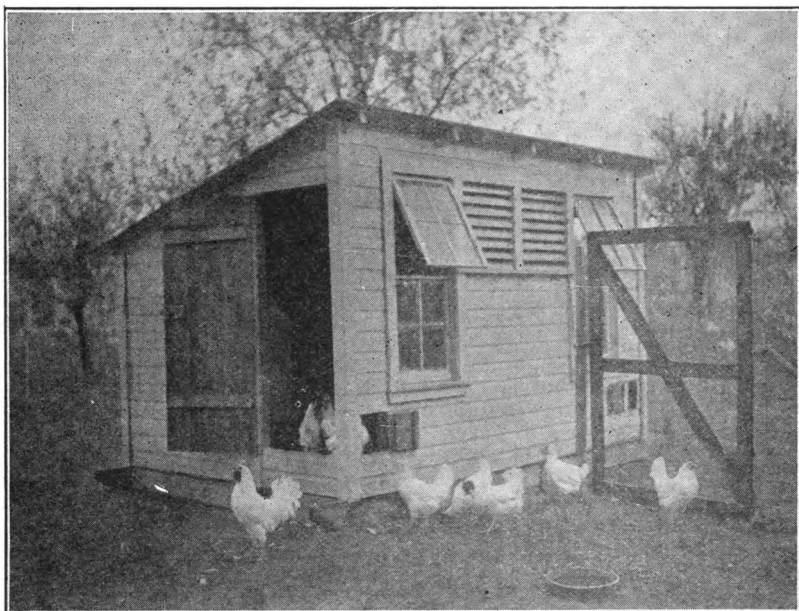


Fig. 10.

Two flocks of ten hens each roosted in this house. Both drank from same pan and ate from the same hopper. One pen contracted disease and died. The other flock remained in good health.

laid. They may then gain entrance to the little chick at the time when the yolk passes into the chick's body and before the chick leaves the shell. That bacteria are in an egg at the time of laying has been proven by the fact that when a fertile egg begins to develop and blood vessels form, and then the embryo dies from change of temperature or unfavorable conditions, the nucleus of decay begins with the embryo and then the whole contents of the egg. It takes bacteria to cause decay or formation of gas in the egg.

Another fact is brought out in the infertile egg. It seems that egg material alone is not good food or proper food for bacteria. Infertile eggs may be placed in an incubator for some time, then left in a warm room for months and not decay. The fluid part of the egg, or water, evaporates and leaves a dry mass in the shell.

Acquired diseases are those contracted after birth or in the chick after it leaves the shell. They are due to external as well as internal causes. A bruise, a cold, or over-feeding and feeding highly concentrated foods may be the starting point of acquired disease. Since poultry diseases are being studied more carefully, acquired diseases in poultry are found to be due to contagious and infectious organisms.

An infectious disease is one where the germs are carried by infected substances, as drinking water, food, pus or handling diseased animals or insects.

Contagious diseases are those where the germs are carried by the air and inhaled through the air passages.

NATURAL IMMUNITY

There is no subject connected with the poultry industry which should receive more attention than the subject of natural immunity, or the power a bird possesses to throw off or resist disease germs. This power may properly be termed constitutional vigor or vitality.

For example, two birds look alike and seemingly are alike in size, shape, health, etc., and both have the same opportunity to contract a disease. One will throw off the disease and never show any symptoms of being affected, while the other may contract it.

Very few diseases are transmitted from parent to offspring, but the weakened tendency is frequently transmitted. A hen which has contracted a disease may not transmit the disease to the chick, but since the hen is not naturally strong in combating that one disease the chick is almost sure to be weak in the same way.

We had a colony house where two pens of birds were kept, roosting in the same house, with only a wire partition, drinking from the same pan, running in yards alike, and fed the same kind of food. One pen contracted roup and six out of ten birds died in spite of all that could be done. The other pen never had a sick bird, and won prizes in an egg-laying contest. The difference was that one pen was strong in natural immunity, while the other was weak.

HOW TO MAKE A POST-MORTEM EXAMINATION

We advise all who write to agricultural colleges and experiment stations for advice about diseases with which fowls are affected to give all symptoms in detail. You should also tell how you are housing and feeding if you expect an intelligent answer. In order to give all information, it is sometimes necessary for you to make a post-mortem examination and note the condition of the internal organs. It is well to familiarize yourself with the organs of a fowl in a healthy state so you can readily note the difference.

We give here an illustration showing how to proceed. It is vitally important that our students know how to make this examination and know how to recognize disease when they see it. For that reason we look with favor upon the suggestion of Dr. F. C. Harrison, a most competent bacteriologist:

Many poultrymen have considerable difficulty in diagnosing the trouble when there is an outbreak of a disease in their flocks, and practically everyone who keeps fowls has occasionally found a dead bird, and wondered at the cause of its death. At times some fanciers have experienced some considerable loss from infectious diseases, owing to negligence in not making a proper examination of the earliest cases. In many instances a prompt recognition of the disease would have saved the poultryman from much loss and inconvenience.

Poultrymen should understand some of the more elementary facts in connection with the source, progress, changes and terminations of disease, for a knowledge of the diseased or abnormal conditions as revealed by the appearance of the organs, etc., immediately after death from the only rational foundation upon which the art of treatment can rest. According to their lesions, diseases are described as organic when characterized by definite lesions or alterations of the organs and tissues, and functional when there are no discoverable lesions, and the disease manifests itself by disturbed physiological or functional action.

Most of the diseases of poultry are acquired; that is, due to certain external agencies, such as cold, mechanical injuries, poisons, infective agents and alterations in the food.

Congenital disease, as for example malformations of the egg, and inherited disease are not of frequent occurrence among poultry.

In studying the processes of disease, defects in one organ affect the body generally, but special conditions arise in which the disease becomes localized, or confined to one organ, or it may become generalized, involving several organs or the whole body.

These facts should be remembered when making an examination of a bird, for a correct interpretation of a diseased condition is essential.

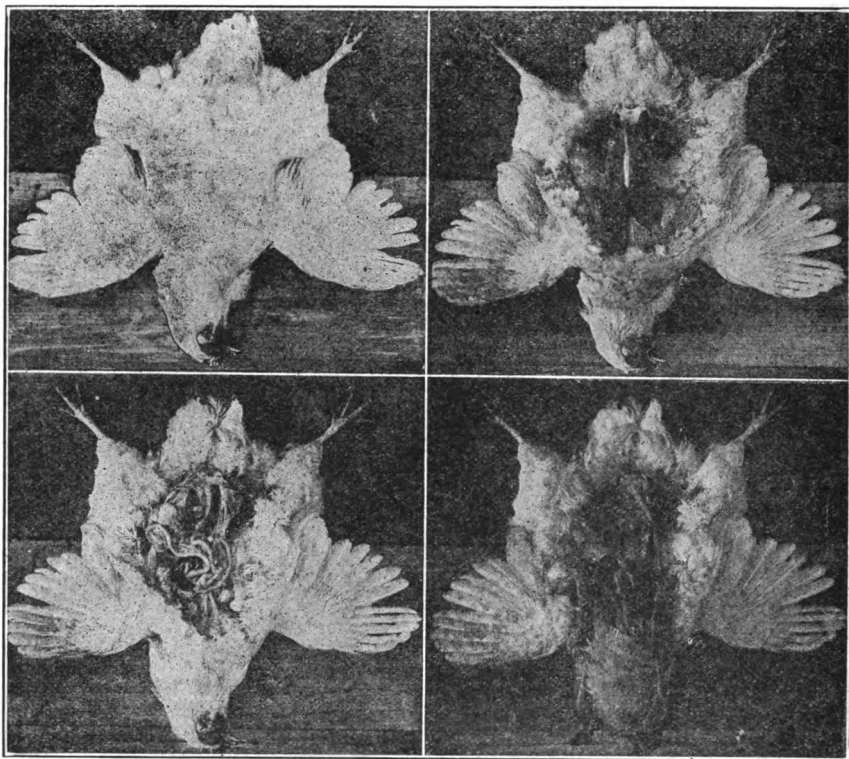


Fig. 11.

The two top pictures show how a hen should be tacked on a board for a post-mortem examination. Drive a small nail through each foot and one through the joint of each wing so the bird will be securely held to the board. The skin and feathers have been removed from the bird on the right so the breast is exposed. The two lower pictures show the breast entirely removed, and this simply leaves the intestines and all internal organs exposed, so that you can make a thorough examination. Examine healthy birds as well as diseased ones, that you may really know when any organ does not appear to be normal. Always make an examination of this kind before writing any authority for information about diseased birds. Give the facts as you see them.

HOW TO MAKE AN AUTOPSY

The following procedure is recommended for those who desire to make an autopsy or post-mortem examination:

Place the bird on a board and carefully and critically examine its outward appearance. Is the weight normal? Examine the breast muscles; if they are shrunk so that the breast bone is readily felt, it indicates poor condition and often the presence of a chronic disease.

The normal appearance of the comb, wattles and eyes varies with the breed. If they are normal, they should be only slightly lighter in color than

during life. If small, light-yellow, raised spots (circular or irregular in outline, and covered with a thick, gray-yellow crust) are present on the comb, wattles and one side of the head, the disease is likely to be "Favus" or white comb, due to the presence of a parasitic fungus. The most common disease with lesions on the wattles, around beak, on the eyelids, and eye, is that known popularly as roup, canker, or sore head, terms which undoubtedly describe progressive changes of the same disease. The disease is characterized by, first, mucous discharges accompanied by inflammation and later by the presence of cheesy-like masses and wart-like tumors. Discoloration of the head in turkeys is an indication of the disease known as "blackhead," but confirmation of such an opinion is necessary by an examination of the liver of the suspected bird.

Examine the nostrils, mouth, tongue and pharynx of the bird; these organs should be free from yellowish patches or wart-like growths. If these are present the disease is in all probability roup.

Push aside the feathers at various parts of the body, and examine for parasites which live upon the external surface of the body. There are thirty or forty species of these affecting various birds, and while they may occasionally cause death, their presence is an indication of unsanitary conditions. They interfere with the vitality of the bird by sucking the blood, gnawing the skin, and interfering with sleep, and thus favoring the attack of an infective agent.

Examine the feathers around the cloaca. If they are soiled, and glued together it is an indication of an intestinal disorder. This condition is the most noticeable external sign of white diarrhea of incubator chicks, and the various forms of fowl cholera in adult birds.

Examine the legs; they should be smooth, the scales well defined and as a rule lustrous. Thickening of the skin on the under surface of the feet is often seen, and is the result of irritation, often caused by too narrow perches which compel the bird to grasp too tightly in order to maintain its position. Such a condition is equivalent to corns in man. The affection known as "bumble foot" is an aggravation of the above described condition, and is often accompanied by abscesses.

Tuberculosis and several other diseases are often accompanied by skin lesions, but the most characteristic appearances are found in the internal organs, and will be subsequently described.

This completes the exterior examination of the bird—and the next step is to open it, so as to reveal the organs in their natural positions.

THE INTERNAL ORGANS

Pluck the feathers from the front part of the breast to the junction of the neck with the body, and with a sharp knife cut through the skin and muscles to the bone, in the manner indicated in Fig. 1 (on page 14), being careful to avoid cutting the crop. Then cut through or break the bone arch (the coracoid), situated immediately in front of the breast bone; for this purpose a pair of bone cutting forceps are most convenient, but in the absence of these the bones may be cut through with a knife or strong pair of scissors. The point of the breast is now free. Then insert two fingers of the left hand beneath the breast bone, grasp the neck of the bird with the right hand and, with a strong and firm pull, draw the left hand back and the breast is torn completely away, exposing the interior of the bird, without displacing the relative position of the organs.

Without moving any parts, note the appearance and size of the various organs exposed to view. The liver, because of the color and size, will be the most conspicuous organ first seen, and we shall begin by examining it. The liver of the fowl is large, of firm consistency, and is divided into two lobes; the left lobe covers a part of the first loop of the intestine and pancreas and part of the small intestine, and the right lobe covers the true stomach (proventriculus) and part of the gizzard or muscle stomach, and the apex of the heart is between the upper end of these two lobes. It will be seen that the liver is molded as it were on these parts and presents corresponding depressions where it comes in contact with them.

The liver probably is the organ in which we find most disease and it should be carefully examined. If the liver is soft, so that the substance of it breaks down easily under slight pressure, and if this condition is accompanied by a mottled grayish appearance, the bird has fatty degeneration, a condition brought about by over-feeding and lack of exercise. This trouble is quite frequent in show birds and manifests itself shortly after they are taken off the bench, when the fancier wishes to bring them back to ordinary condition. Fatty congestion is often accompanied by the rupture of a blood vessel and sudden death.

The famous *pate'-de-foie-gras* is made from the livers of geese which have been over-fed and under-exercised until their livers undergo this fatty change. They are then killed and the paste or *pate* is made from the diseased liver.

A liver affected with tuberculosis is usually much enlarged, the increase of size depending on the amount of disease present. Accompanying the enlargement are numerous white to yellow nodules, varying in size from that of a pin's head to an inch or more in diameter. If any of these nodules are opened the contents will be found of a cheesy consistency. Poultrymen often refer to this disease as "spotted liver" or "liver complaint."

The liver of turkeys affected with "blackhead" is enlarged and darkened, and scattered over the surface are round spots, sometimes white and sometimes yellow. They are often depressed or sunken in the middle, the outside ring dark and the inner portion white in color.

Wasting of the liver is sometimes seen. In this case the organ is small and shrunken, often yellowish in color. This disease is due to improper feeding.

If we lift up the right lobe of the liver we shall note in a shallow depression the gall bladder. This is green in color and contains the bile, and is sometimes the seat of disease. The bile should be fluid. Too large a secretion of bile often distends the bladder and colors the surrounding organs green. Should the duct which connects the bladder and intestines become inflamed or plugged up, the bile is absorbed by the blood vessels and causes a yellowing of the tissues and flesh. This condition is known as jaundice. A small oval dark-red body situated just beneath the liver is the spleen. In birds suffering with tuberculosis it presents somewhat the same features as are described under tubercular liver.

The heart is not often diseased; occasionally we find it ruptured and the body cavity filled with clotted blood.

Attention should be next directed to the lungs. These are situated just above the heart and are easily recognized by their bright red color and spongy consistency. The lungs in birds are attached to the inner side of the walls of the chest.

The most common infection of the lungs is congestion or inflammation. This is easily recognized by parts of the lungs being dark in color and solidified. If such pieces are cut out and thrown into a glass of water they will sink. Healthy lung tissue always floats.

The digestive organs next claim our notice. It is better to examine these throughout their entire length. Begin with the gullet and follow it to the crop, in which the food is softened. The walls of the crop are thin and muscular. The two most common manifestations of disease are (a) inflammation:—In this condition the crop is much distended and the contents very liquid and gassy and of an offensive odor; (b) paralysis:—In this state the muscular walls are so stretched that their use is lost or paralyzed, and in consequence the food cannot be emptied. The crop in this disease is usually very large and packed solid with food.

Leaving the crop, follow the tube in the direction of the gizzard; just before this organ there is a wider portion known as the true stomach or proventriculus. The food from the crop passes into this in small quantities and becomes mixed with the gastric juice secreted by glands in the walls of the true stomach. This juice aids in the digestion for the albuminoids of the food, but the grinding action of the gizzard is necessary to crush and macerate the seeds which are the food of so many birds. The true stomach is

often the seat of inflammation, which can be recognized by the thickening of the walls and the collection of much mucous on the inner walls.

From the proventriculus pass on and examine the gizzard. It will be necessary to cut the skin over the surface of the intestines at this stage, and the gizzard may then be pulled out and examined. The gizzard has been very properly called the "muscular stomach," and if you take a knife and cut it in two, the thick, fleshy muscular walls, of a dark red color, will be observed, and lining it the horny internal wall, of a greenish-yellow color, with numerous shallow folds. The grain and seeds are here ground up by the action of the muscles aided by the grit and gravel which is mixed with the food.

The gizzard does not often show indications of disease. Occasionally we find a pin or tack penetrating the hard interior lining into the muscular tissue, with discoloration and death of the surrounding tissue. In birds poisoned with phosphorus from eating rat poison and matches it usually shows some slight inflammation. If the contents of the gizzard are smelled, the odor of the phosphorus can be noticed.

Leaving the gizzard we follow the intestine throughout its length. The first loop of the small intestine surrounds the pancreas, a narrow elongated organ, pinkish in color, firm, and with a granulated surface; certain ducts from this gland pour the pancreatic juice which emulsifies the fat of the food, into the small intestine. The small intestines are quite long, and continue until we reach a portion where we meet with two blind ends. This point marks the beginning of the large intestine, and it ends at the orifice, called the cloaca. The two blind tubes called the caeca also open into the cloaca.

DISEASES OF THE INTESTINES ARE COMMON

The intestines vary in color and appearance throughout their length. They are pinkish white, and when carefully inspected numerous fine blood vessels will be noticed all over their exterior surface. The caeca are greenish white in color, the blind ends as a rule darker than the portion nearer the cloaca.

No portion of the bird or no organ, excepting perhaps the liver, is more prone to be affected than the intestines. All intestinal troubles, like catarrh, diarrhoea, cholera, enteritis, etc., produce more or less profound changes in the appearances of the intestinal tract, the most significant of these being the reddening of the intestine and dilation of the blood vessels.

In the disease of turkeys already mentioned (blackhead), the caeca are the principal seat of the disease, the walls become greatly thickened and the canal fills with a yellowish white mass, built up of layers of blood and cells. Sores with crusts also form on the walls.

The contents of the intestines should be examined for the presence of worms, as both wire worms and tape worms attack poultry.

We have now lifted out of the body cavity the bulk of its contents; there remains, however, at the very bottom the kidneys. These may be recognized as flattened, elongated bodies, fitting closely into the hollows of the pelvis. They commence immediately below the lungs, and extend along the sides of the spine as far as the rectum. Their texture is rather frail, rapidly yielding under the pressure of the finger, to which they give a granular sensation. The secretion from the kidneys is not fluid as in mammals, but is a white semi-fluid mass which soon hardens, sometimes causing obstruction of the cloaca. This is noticeable in the white diarrhoea disease of chicks. Too much animal food may produce the same trouble in pullets.

In male birds the testis are two in number, oval in shape and whitish in color. They are situated near the upper extremities of the kidneys. They vary in size with the season of the year, becoming large during the breeding season. They connect by two tubes, which lie close to the ureters, with a small opening on the projection on the wall of the cloaca.

In the female, the ovary and oviduct on the right side are entirely lacking, or are so reduced as to be hardly noticeable, but the organs on the left side are very large and well developed, especially during the breeding season. The ovary is situated in the abdominal cavity near the lumbar vertebrae. It consists of a grape-like mass or cluster, composed of a large number of

ovules in various stages of development, some very young, small and white, others older, of considerable size and yellow in color. From the ovary a long tube conducts the egg to a small but dilatable opening in the cloaca. This tube called the oviduct, is rather long, of wide diameter, dilatable and flexuous, and only exists in the state here described during the breeding season; at other times it is much smaller and shrunken. The oviduct has three well marked regions.

(1) The wide open mouth at the top near the ovary.

(2) The twisted or coiled glandular part, which secretes from the glands its folded mucous membrane the albumen or white of the egg, which is added in layers on the yolk.

(3) A short wide portion which produces the egg shell and which opens into the cloaca.

The most common disease of the ovary is gangrene, easily recognized by the brown or discolored ova, accompanied by putrefaction. Tumors are often found and look like the yolk of a hard boiled egg.

The oviduct may also become gangrenous and the tissue decompose and putrefy, and the eggs escape into the abdominal cavity.

PRECAUTION

In no circumstances should you doctor a sick fowl or make an examination of one, then feed and water your poultry, without first taking every precaution to cleanse your hands. You may spread disease in this way, and can also carry it on your shoes, or on your clothing. Do not use the same feed bucket for both sick and healthy birds. You cannot be too careful in preventing the disease. Buckets and vessels used for diseased birds should be painted red, which signifies "DANGER."

ISOLATION OF THE SICK AND DISPOSAL OF DEAD BIRDS

There is no practice so detrimental to the health of a flock as that of allowing sick birds to remain in the flock until they die. Every one should have a place for keeping sick birds away from the flock; a coop in the garden where other chickens are not permitted to go is usually one of the best places.

It is a good plan to bury, or a better plan to burn, all diseased birds as soon as they die or as soon as they are killed. All birds which contract any serious disease should be killed. If they cannot be burned, the next best method is to bury them deep in some out-of-the-way place where the flock does not range. Covering with lime, then with earth, is an excellent idea. Never permit any dead birds or other animals to be around the premises.

FOOD AND QUARTERS FOR SICK BIRDS

When fowls become sick with any disease, it is best to remove them to a coop or a house, where the birds can rest in comfort, and be separated from the general flock and not be disturbed. The coop should be on a high spot of ground and dry. It should not be artificially heated, but provided with ventilation day and night. Put up a perch, have clean litter and a clean drinking pan. The quarters for sick birds should be clean, dry and comfortable.

Many poultrymen make the mistake of feeding whole grain to their sick birds. We prefer a ground grain mash mixture composed of equal parts cornmeal, wheat bran, middlings and ground oats. Slightly moisten this with sweet or sour milk. Feed sparingly until the birds begin to regain their health. Epsom salts can be fed in this mash. We recommend formula No. A1, as mentioned under treatment for roup. Table scraps are very good for sick chickens. Whatever is fed, we think best to feed sparingly. Give the food on a clean board, trough or pan provided for that purpose. Remove the feeding vessel after each meal and never leave feed for the sick birds to walk over.

CARELESSNESS

Carelessness and neglect often cause trouble. The above cut shows a healthy chick kept in a brooder in which the droppings have not been cleaned out as they should have been. This caused balls to accumulate on

its toes till it could not walk. If not attended to, such chicks will grow weak, contract disease and die.

MOULTING

The moulting time is a very important season in the year's work of the hen, as her success during the winter depends greatly upon the coat she wears.

The better condition in which a hen goes through the moult the sooner she will begin laying and the more eggs she will lay during the winter. Moulting is not considered a disease, but the birds should receive the best of care when in this condition. There are said to be about 8,000 feathers on a hen, and you can see that the manufacture or growth of this large number of feathers would be a great drain upon the hen's system and very telling upon her vitality in many cases.

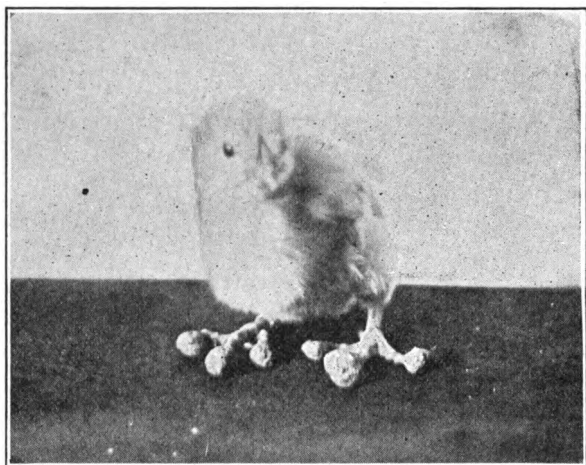


Fig. 12.

Filthy brooder floors have caused balls to accumulate on the toes of the chick until it can scarcely walk.

HOW TO CLEAN AND DISINFECT A POULTRY HOUSE

The following excellent advice is given by Dr. Raymond Pearl of the University of Maine:

"Not every poultryman of experience really knows how to clean a poultry house. The first thing to do is to remove all the litter and loose dirt which can be shoveled out. Give the house—floor, walls and ceiling—a thorough sweeping and shovel out the accumulated debris. Then play a garden hose, with the maximum water pressure which can be obtained, on the floor, roosting boards, walls and ceiling, until all the dirt which can be washed down easily is disposed of. Then take a heavy hoe or roost board scraper and proceed to scrape the floor and roosting boards clean of the trampled and caked dressing and dirt. Shovel out what has been accumulated and get the hose into action once more and wash the whole place down again and follow this with another scraping.

"Next, with a stiff-bristle broom, thoroughly scrub walls, floors, nest, boxes, roost boards, etc. After another rinsing down and cleaning out of accumulated dirt, let the house dry out for a day or two. After this process make a searching inspection to see if any dirt can be discovered. If so, apply the appropriate treatment as outlined above. If, however, everything appears to be clean, the time has come to make it really and truly clean by disinfecting. To do this it is necessary to spray or thoroughly wash with a scrub brush, wet in the solution used for all parts of the house, with a good disinfectant at least twice, allowing time between for it to dry."

Any of the good disinfectants can be used, such as creolin, zenoleum and others.

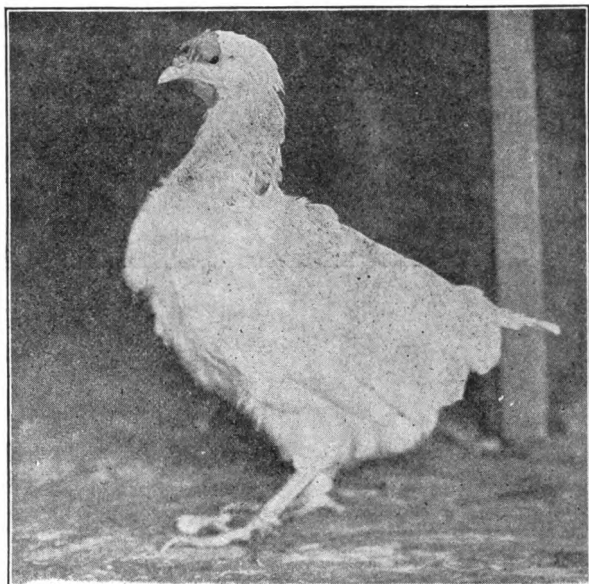


Fig. 13.

MOLTING.—There are about 8,000 feathers on a hen and each has to manufacture her own winter coat. This is quite a strain on the hen and is a dangerous time in her life. For that reason she should be protected from storms at this period. It requires about three months to molt and to recover from it, so don't expect many eggs from your hens during this time. The hens must have a rest.

To make a complete job, follow the foregoing treatment with a white-wash brush, and your house will be clean and healthful as hands can make it. The whitewashing will depend upon the time of year and the accommodations for the fowls, but if possible have it done before they are again allowed to enter the house. A good whitewash, one that will stick and not rub off, is made as follows, in these proportions:

UNITED STATES GOVERNMENT WHITEWASH

Unslaked lime.....	two pecks
Common salt.....	one peck
Rice flour.....	three pounds.
Spanish whiting	one-half pound
Glue	one pound
Water	sufficient quantity

The quantities given are sufficient to make nine or ten gallons of white-wash. If only part of the whitewash is needed, the remainder can be kept for future use. Should a smaller quantity be desired, the proportions can be cut down to suit.

DIRECTIONS—To properly make the amount of whitewash above mentioned, two vessels are needed, one holding at least ten gallons and the other holding half as much. A small barrel and a tub or any water-tight vessel will answer very well.

1. Slake the lime in the barrel, using two or three gallons of water for two pecks of lime.
2. Cover the barrel.
3. Dissolve the salt in water, strain the brine and add it to the slaked lime in the barrel.
4. Boil the rice flour for ten minutes in a small quantity of water.
5. Dissolve the glue in a double cooker or water bath and avoid scorching.
6. In the tub mix the whitening with about five gallons of hot water.
7. Add to the whitening mixture in the tub the boiled rice and the dissolved glue. Mix thoroughly.
8. Pour the mixture in the tub into the barrel containing slaked lime and stir well until thoroughly mixed.
9. Cover barrel to protect from dirt and let whitewash stand for a few days, when it will be ready for use. This whitewash should be applied hot if best results are to be obtained.
10. Heat it in any kettle or other vessel on a stove or suspended over a fire.

Before allowing the fowls to return to the clean house they themselves should be made clean by a thorough treatment for lice.

TREATMENT OF THE YARDS

The poultry yard is as often a source of infection as the poultry house. Poultry that is allowed to run on one piece of ground year after year, the yard not cultivated, the soil not stirred and no green food grown on it, is certain to become contaminated by various germs, sooner or later. Many failures can be traced directly to soil contamination. This is a very important thing and never should be neglected. If the yards are not large enough to be plowed, then have them spaded and seeded. We prefer free range, and if it is necessary to yard and confine the birds, we like the double yard system. Thus we can grow some food in one yard and cultivate it while the fowls use the other.



Fig. 14.

Spade or cultivate yards. Keep the soil pure and sweet. Sour, filthy soil breeds disease.

We find many farmers and some poultrymen who, in spite of the fact that they have an abundance of land which is available, and might be used, will exercise the short-sighted policy of having small yards and will keep the coops, houses and poultry on the same ground year after year and never cultivate or try to sweeten and purify the soil.

Put lime on the land if it is badly contaminated. Plow this into the soil. Cultivate the ground, and expose the soil to the action of the sun, air and rain. Grow some crops or green food for the poultry at the same time. It will pay to heed this advice.

FAKE REMEDY COMPANIES

A lot of money is being made by certain fake remedy or poultry supply companies. They are advertising and selling large quantities of remedies, so-called egg producers, etc., in which there is not a nickel's worth of virtue. If you wish to buy something already prepared for the treatment of various diseases, we would advise you to use remedies from dependable firms. All reliable firms have experts employed who are trying to perfect remedies and various methods of treatment, and they give you your money's worth.

REMEDIES WHICH WE RECOMMEND

As a treatment for practically every disease, we have recommended more than one method. We do that, not to confuse you, but for the reason that some things can be secured from certain local druggists, and other things which we recommend are not procurable from these druggists. Therefore, it is necessary to give more than one treatment in most cases. But those which we do give have proven to be the very best and no serious mistakes will be made in using any of them. You will find that a certain bird will respond to one treatment and the same bird will often not respond to a different treatment. So if you are not successful in the use of one remedy, try another. Remember that a few days must be allowed for any remedy to have time to become effective and show results.

AN INTESTINAL ANTISEPTIC

A good intestinal antiseptic can be made by using one 7.2 grain tablet of bichloride of mercury to each gallon of drinking water. Use cement, earthen or wooden vessels as bichloride of mercury is affected by metal. This antiseptic is a good thing to use in cases of diarrhea.

WHY A FOWL BREATHES

The body of a fowl is like a furnace in that it takes fuel and burns it, forming heat and energy. Its food, like the fuel of a furnace, consists principally of carbon and whenever carbon burns heat is formed and carbon dioxide is created. The oxygen in the air which they breathe combines with the carbon in their bodies to keep them warm and give them strength to move about and lay eggs. The carbon dioxide so formed is breathed out through the lungs.

A pound of carbon burning in a bird's body forms the same amount of heat or energy as it does when it burns in a furnace, but the combustion is much slower and is taking place all of the time. The original source of all their food is from plants which also breathe, only the process is reversed in their case. Plants breathe in carbon dioxide from the air and separate the carbon from the oxygen. The oxygen is returned to the air and the carbon is used to build up the tissues of the plant. Thus we see a continuous cycle; a bird eats the plants as food and returns the material to them through the air. The supply of oxygen and carbon dioxide in the air is kept in about the same proportion although it may vary somewhat in different localities and under different conditions.

The source of all heat and energy is the sun. Plants use this energy, which comes to them in the form of sunlight, to manufacture carbon from the carbon dioxide of the air, and they store up this carbon in their tissues for man and fowl to utilize as food and fuel. Our breathing then has the same relation to our bodies that the drafts have to the furnace; it furnishes oxygen to the carbon of our food so that it will again form into carbon dioxide and liberate the heat and energy which the plants stored up from the sun.

FROZEN COMBS AND WATTLES

Frostbitten combs should be thawed out slowly. Put the bird into a room that will warm up gradually, for the circulation should not be allowed to begin suddenly. Snow held against the frozen comb is often recommended. After the circulation has been restored and the comb thawed out, apply an ointment twice a day, made of two tablespoonfuls of glycerine, one tablespoonful of turpentine and six tablespoonfuls of vaseline. Camphophenique applied locally is often beneficial.

This question is often asked, "Will a frozen comb affect the future breeding qualities of a bird?" We have not found that this has any effect whatsoever on breeding stock, except during the period when a bird was suffering from a frozen comb. After the comb had entirely healed over and the frozen part had dried up and dropped off, we have never experienced any trouble along this line.

One of the best preventives and remedies that we have ever used is skunk oil. If you feel that it is going to be an extremely cold night and the temperature will go far below freezing point, if you have any choice males whose combs you are anxious to save, it is a good idea to go to the poultry house before dark and put some oil on the comb and massage it well. Do the same in the case of the wattles. Rub the skunk oil on freely and then massage it well. This has really proven to be one of the most effective preventives and remedies that we have used for frozen combs.

DUB COMBS TO PREVENT FREEZING

On some poultry farms it is the custom of the owners to dub all of the birds, both male and female. They claim that the extra feed, blood and vitality that is required in maintaining the comb is of no benefit and for that reason they dub the birds, both comb and wattles.

A bird with a frozen comb suffers intense pain, and during that period will stand around drawn up and sometimes die because of the frozen part, but after the comb is healed over they make just as good breeders as they would had their combs never been injured.

CHICKEN POX OR SORE HEAD

We have tried various methods of prevention and treatment of this disease. Usually you can recognize it by the following symptoms:

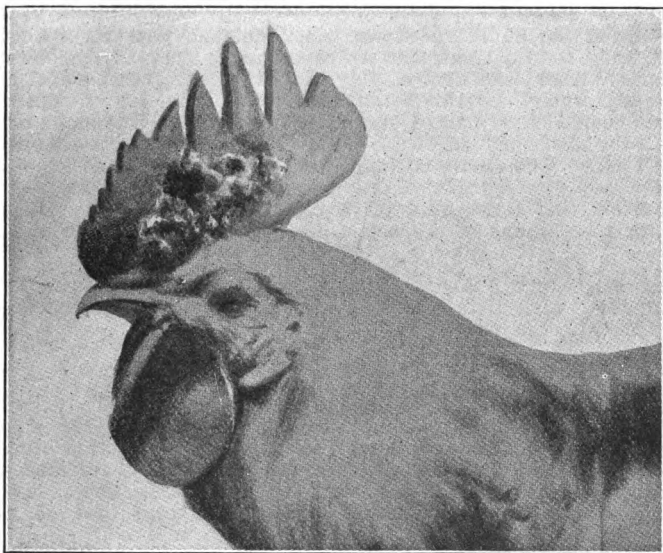


Fig. 15.
Chicken Pox or Sore Head. Treat as directed.

Little warts, nodules or scabs form on the comb, face and wattles. When one starts, several usually follow. The disease is not necessarily fatal, but gives the bird an ugly appearance, and may result in affecting the general health. The disease is contagious. It is often started by birds brought into the flock, and is especially noticeable in damp, cold weather in houses which are not kept clean and dry or properly ventilated.

TREATMENT:—The small nodules or scabs should be removed with the fingers, simply pulling the scab off. Take a camel's hair brush or a clean feather and dip it into undiluted zenoleum or creolin, or tincture of iodine and touch the sores lightly with the feather or brush. Another scab will form and in a few days drop off. Rub the face, comb and wattles with mentholatum, menthol salve or carbolated vaseline. Do not pick at these scabs continually. Once removed and treated is sufficient.

As soon as any indication of an outbreak of chicken pox is noticed, you should measure out about three-fourths of a teaspoonful of Epsom Salts to each fowl and then feed it to the entire flock. Dissolve the salts in water and moisten some ground feed with this solution. Starve the birds for one meal before feeding same. Repeat this in about three or four days. After the sores have been treated once, it is not necessary to treat a second time.

Very often cases of chicken pox can be cured by touching the scab and rubbing the zenoleum or creolin around and over the scab. If the scabs form on the eye lid, there is danger of the eye being put out. In cases of this kind it is a good idea to make a solution of two parts water and one part creolin or use undiluted zenoleum. Use two or three drops of this in the eye thus affected.

The vitality of the flock must be increased by stimulating, palatable feed, such as milk, mash, green feed, green cut bone, and grain. A tonic of 1 part epsom salts, 1 part dry powdered sulphur to 12 parts of dry mash has given good results. Mix to a crumbly condition with milk or water and feed every other day until the condition of the flock improves. Bad cases with false membranes in the mouth should be killed and burned. All others should be isolated, when possible. These cases should receive a head bath in 1 to 1,000 solution of bichloride of mercury, made by placing a 7.3 grain tablet in a pint of water.

PREVENTIVE FOR CHICKEN POX

In some of the Southern States where chicken pox or sore head is so prevalent, they have a treatment which seems to prevent this disease to a great degree. About the first of July they dissolve a teaspoonful of epsom salts in warm water, and this solution is used to moisten enough mash for a dozen chickens. Every third or fourth day they add the same amount of sulphur to the mash instead of the salts. They keep up this alternate treatment until fall. The result is their flocks seem to be immune to this and other diseases. Our opinion is that the systems of the fowls are in such good condition that they throw off the germs. Formula No. A1 as recommended for roup is one of the best things that can be fed to prevent this disease.

If the crusts or nodules are removed, the head washed in a solution of water and some good disinfectant, and then the sore dusted with iodoform, it will often effect a cure.

FLOCK TREATMENT FOR CHICKEN POX

As a flock treatment for chicken pox, we use three (3) ounces of sulphuric acid and three (3) ounces of oil sassafras mixed with one-half gallon of water in an earthen vessel. Supply this to the flock by placing two tablespoonfuls of the above mixture in each gallon of drinking water. Use no other water for a week or two. After desirable results begin to be noticeable, reduce to one tablespoon of above mixture to each gallon of drinking water until the flock is entirely free from the disease. In mixing the above it is well to do so out-of-doors, as occasionally we have had an explosion when the acid and sassafras are mixed together in a close, warm room. You will experience no difficulty, however, out-of-doors.

REMOVE SCABS ONLY FOR FIRST TREATMENT

Individual birds, badly infected, should be removed from the flock and placed in coops in dry, comfortable quarters. Remove the scabs from about their face, comb, wattles or ear-lobes and paint the raw spots with full strength of tincture of iodine. Repaint the spots once each day until they are finally dried and crumble off. Do not remove the scabs except the first time.

TREATMENT—TINCTURE OF IODINE

Of the various kinds of disinfectants recommended for the treatment of this disease, tincture of iodine has been found to be the most satisfactory. The scabs which form on the tumors of the comb, wattles or skin should be removed with a dull knife or a pair of forceps and tincture of iodine applied to the exposed surface.

Collections of exudate on the mucous membrane of the mouth should be removed with forceps or a curette and the exposed membrane treated with tincture of iodine. All collections of exudate on the eyelids can usually be removed by pressing with the thumb and finger tips around the eye. If any of the exudate should adhere to the cornea it should be removed with forceps and it may sometimes be necessary to use forceps also in removing the exudate from beneath the third eyelid at the inner corner of the eye. Afterwards drop one drop of tincture of iodine into the diseased portion of the eye lid. Try not to touch the eye ball.

The tincture of iodine can be applied most conveniently in all cases with a feather or camel's hair brush. Treatment should be repeated as often as the scabs or exudate reform. Any fowl that does not show a marked improvement in condition after three or four treatments will usually recover very slowly. In such cases, unless the fowl be very valuable for show, breeding or other purposes, it is more economical to destroy it than to give further treatment. Never remove the scabs except for the first treatment. After that paint and treat right over the scab.

Collections of exudate within the nasal sinews always produce marked swellings of the face. This condition is relieved by making an incision through the skin over the swelling, removing all the exudate with a pair of forceps or curette, and then packing the cavity with absorbent cotton saturated with tincture of iodine. The cotton pack is necessary to keep the incision through the skin from healing too rapidly. If not packed, the wound will quickly heal, the exudate reform and no benefit be derived from the operation. The pack also assists in controlling the hemorrhage which is always severe. When the hemorrhage is unusually severe, it should be checked by the application of a strong caustic, such as silver nitrate. The cotton pack should be removed, the wound cleansed and a new pack put in every two or three days as long as the exudate continues to form. When, upon the removal of the pack, it is found that no exudate has formed, the pack may be left out and the wound allowed to heal.

THE TREATMENT AND PREVENTION OF CHICKEN POX

There is perhaps no authority in this or any other country who has done as much along experimental lines, treatment and prevention of chicken pox of fowls, as has Dr. J. R. Beach of the Division of Veterinary Science of the University of California. We therefore want you to get his viewpoint.

Chicken pox is a disease that has been very prevalent among fowls in the state of California. While Mr. Quisenberry was in charge of the Poultry Department at the World's Fair at San Francisco and had charge of the International Egg Laying Contest which was held in connection with same, Dr. Beach was in charge of the disease work in connection with the same fowls and was experimenting on cases of chicken pox on these same birds. He was developing a vaccine for the treatment and also for the prevention of the disease and was meeting with wonderful success at that time and has perfected same since that date. He has treated thousands of fowls in that state with good results since that time. I do not believe anyone has perfected vaccine to such a point as he has for this particular disease.

Mr. Quisenberry was so impressed with the work that he had Dr. Beach deliver an address before the American Poultry Association on this subject during the Exposition at San Francisco. One of the most recent discussions of the subject by Dr. Beach was his address before the American Association of Instructors and Investigators, which was recently published in their journal. Dr. Beach says:

"The relationship between the various pathological conditions of the head of domesticated fowls has been the subject of much controversy. These conditions are variously designated as chicken pox, contagious epithelioma, avian diphtheria, canker, colds, contagious catarrh, swelled-head, roup, etc. Ward and Gallagher in their recently published work, "Diseases of Domesticated Birds," express the opinion that all of these conditions are due to the same etiological factor, namely, "the filterable virus of chicken pox or contagious epithelioma." The results of extensive study of these diseases at the California Agricultural Experiment Station, however, have led us to the conclusion that, as they occur in California, there is a distinct difference between some of them.

"*Classification of Diseases Involving the Skin or Mucous Membrane of the Head:* In order that there may be no misunderstanding of the nomenclature of lesions or diseases used in this discussion, I will give briefly our conception of them. *Chicken pox or contagious epithelioma* is a readily transmissible disease manifested by the formation of small, wart-like epithelial tumors on the comb, wattles, or skin of the head. The sole causative factor of this disease is accepted to be the filterable virus of contagious epithelioma. *Canker or avian diphtheria* is manifested by formation of masses of adherent, cheesy exudate on the mucous membrane of the mouth or eyes. These diphtheritic lesions should not be regarded as evidence of a specific infectious disease, since factor other than the filterable virus of contagious epithelioma are known to sometimes produce them. *Colds, catarrh and roup* are manifested by a viscid discharge from one or both nostrils, which has a tendency to collect in the nasal sinuses where it undergoes rapid transformation into a cheesy mass causing marked swelling of the face beneath the eyes. Such lesions, as in the case of canker, are believed to be due to a variety of causes.

"There is abundant evidence, both clinical and experimental, to indicate that chicken pox and the most common form of canker are due to the same causative factor. Diphtheritic lesions or canker in the mouth or eyes can be produced by intravenous or subcutaneous inoculation with a suspension of finely ground chicken pox virus derived from scabs removed from the tumors on the skin of diseased birds, or by applying the virus to a scratched surface on the comb. In like manner, typical chicken pox lesions may be produced by inoculation of the comb with material from mucous membrane lesions. A vaccine prepared from desiccated chicken pox scabs affords protection against canker as well as chicken pox. In outbreaks of chicken pox, the number of affected fowls with canker of the mouth or eyes only may be as high as sixty per cent.

"However, as above stated not all cases of canker can be regarded as due to chicken pox virus. We recognize three distinct forms which for convenience we classify as *chicken pox canker*, *mechanical canker* and *malignant canker*. Mechanical canker is produced by injury to the mucous membrane. It commonly occurs in the cleft in the hard palate and inner corner of the eye as a result of a particle of litter or kernel of grain becoming lodged there. Removal of the cause results in prompt recovery. *Malignant canker* is so classified on account of its nature. It commonly occurs on the base of the tongue or the side of the larynx, penetrates deeply into the tissue, does not respond to any treatment so far attempted, is accompanied by general symptoms such as depression, loss of appetite, and rapid emaciation, and practically always terminates fatally. All attempts to determine the cause have thus far been unsuccessful. However, since it is of rather rare occurrence and has shown no tendency to spread from diseased to healthy fowls in the same flock, it is not yet of much economic importance. Since chicken pox is the subject to be discussed, when the term "canker" is used hereafter in this paper it will refer only to "chicken pox canker."

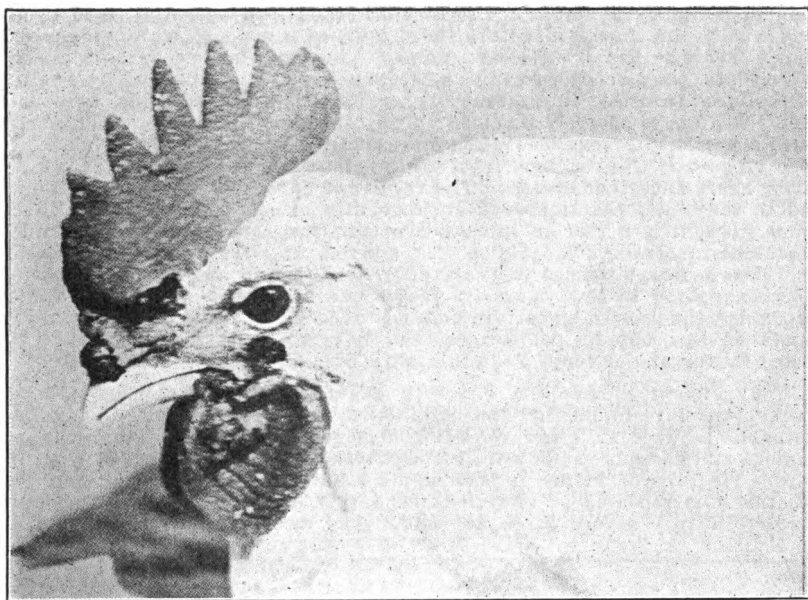


Fig. 16.
Chicken pox on cockerel—natural infection.

"We have found little to indicate that there is any relationship between chicken pox and roup, but instead, considerable evidence that they are not, as a rule, in any way related. A nasal discharge is so infrequently associated with canker, especially in the early stages, that it would seem there is little ground for considering this an indication of chicken pox or canker when it does occur. Even in very severe advanced stages of canker, the nasal passages are not necessarily involved. On the other hand, it is extremely rare to find canker of the eyes or mouth accompanying roup. Even though the sinuses may be so distended as to cause the eyes to become closed, as a rule, no cheesy material is formed in them. It is a well established fact, that birds that have recovered from chicken pox are immune to the disease. It has been frequently observed, however, that birds that have had chicken pox are not rendered immune to roup, nor that birds that have had roup are immunized against chicken pox. It is very probable that there are always a few cases of roup present in all large flocks no matter how well they may be housed and cared for, but we have yet to observe an epidemic of roup in any flock in California, that was given proper care. Chicken pox and canker are just as liable to attack a well cared for flock as one poorly cared for. Therefore, we do not consider roup to be related to chicken-pox, to be a specific infectious disease nor a menace to successful poultry raising.

*"A Malnutritional Disease Resembling Roup:—*There has occurred during the last year epidemics of a disease involving the mucous membrane of the mouth, pharynx, eyes and the nasal passages which closely simulates roup, but which has been found to be entirely distinct. In the mouth and pharynx we find pustule-like caseous patches 1 to 2 mm. in diameter. On pressure, we find that the caseous material penetrates quite deeply into the mucosa. These may be so numerous as to give the mucosa, especially of the pharynx, the appearance of being covered with caseous false membrane. These pustules are often found in the mucosa of the esophagus as far as the proventriculus. We also frequently find the cleft in the hard palate and the glottis filled with caseous exudate. In the eyes we find first

a thin, viscid discharge which may glue the eyelids together, then the formation of a tightly adherent white membranous film over the third eyelid, and finally the collection within the eyelids of a mass of white cheesy exudate. There is usually a clear, viscid discharge from one or both nostrils which later may become turbid and flocculent, and be followed by swelling of the nasal sinuses. On post-mortem examination of dead birds, we usually find the kidneys severely involved. They are usually very pale and marked with a network of very fine white lines which are urate filled tubules. We also frequently find a deposit of white material, probably urates, on the liver, heart and other organs. The results of our study of this disease have led to the belief that although it frequently affects large numbers in the same flock, it is not of an infectious nature, but rather due to some nutritional disturbance. This belief was arrived at after failure to transmit the disease from diseased to healthy birds or to find any species of bacteria which appeared to be a causative factor and success in controlling and reproducing the disease by certain methods of feeding. This disease is always mistaken for roup by poultrymen, and it is very possible, that many so-called "outbreaks of roup" have in reality been this nutritional disease.

*"Treatment of Chicken Pox:—*In the treatment of chicken pox and canker, we have found that the administration of chicken pox vaccine is a valuable adjunct to other remedial measures. The scabs from the pox tumors and caseous exudate from the mouth or eyes are removed with forceps. Tincture of iodine is then applied with a medicine dropper. This treatment is repeated at two or three day intervals as long as necessary. Except in very severe cases not more than two or three treatments are

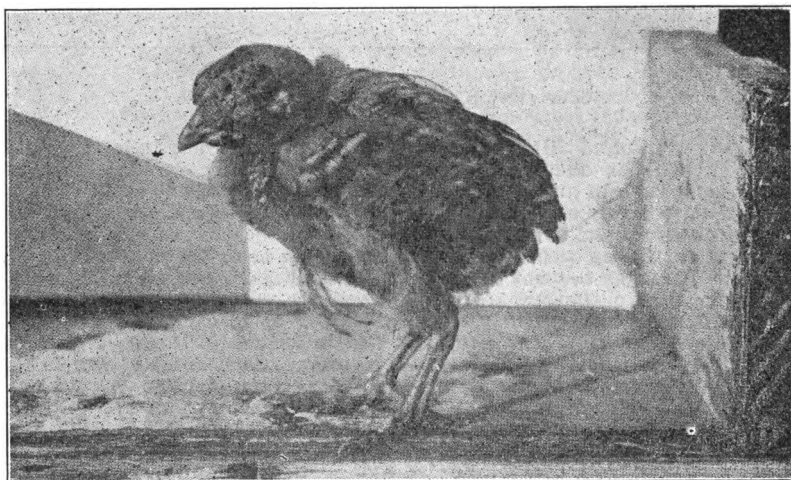


Fig. 17.

Chicken pox, baby chick—natural infection.

necessary. In addition, two or more 1 or 2 mil doses of chicken pox vaccine at three to five day intervals are given. In experiments to determine the curative value of chicken pox vaccine, five hundred and thirty-six diseased fowls were used. They were divided into two lots of two hundred and sixty-eight each. In order that there might be a nearly equal number of fowls in each lot with lesions of the same type and degree of severity, the location and severity of the lesions were the basis upon which the selection of the birds for each lot was made. Each bird in one lot was given two 1 mil doses of vaccine in addition to local treatment of the lesions, while the birds in the other lot received local treatment of the lesions only. The percentage of mortality of fowls in the lot receiving vaccine was 19.6, and of those in the lot not vaccinated 38.9. The average number of days required for recovery of the fowls vaccinated was 10.8, of those not vacci-

nated 13.7. From these results it would appear that the use of vaccine is of considerable value in the treatment of chicken pox and canker.

*"Prevention by Vaccination:—*It is for prevention rather than cure, however, that chicken pox vaccine is designed and chiefly used. The first vaccine experiments in California were made in 1914. The results obtained were so satisfactory that the vaccine was recommended for use to commercial poultrymen. It was only natural that at first many poultrymen were skeptical of the value of vaccination. Continued good results, however, soon dispelled this skepticism and at present in California the use of chicken pox vaccine by poultrymen is as general as the use of blackleg and anthrax vaccine by cattle raisers in infected districts. During the fiscal year ending June 31, 1920, the California Agricultural Experiment Station furnished vaccine for over 300,000 birds.

*"Propagation of the Virus:—*The method used in preparing vaccine is a development of that used by Manteufel in 1909 and Hadley and Beach in 1912-13. Scabs removed from chicken pox lesions are the source of virus used in preparing vaccine. The virus is propagated by inoculating the combs of healthy cockerels with a suspension, in sterile water, of dried ground scabs. Only scabs from the comb are used, any lesions developing upon the mucous membranes being discarded. The inoculation is made by moistening one side of the comb with the suspension of ground scabs then vigorously scarifying the entire surface with a large dull hypodermic needle or other instrument, and then moistening the scarified surface with the suspension of scabs. This process is repeated on the other side of the comb. Care is taken that none of the virus comes in contact with the mucous membrane of the eye. Lesions appear in five to seven days and develop sufficiently to permit the removal of scabs in two to three weeks. A second growth of scabs can be removed seven to ten days later. The percentage of mortality of the inoculated birds ranges from fifty to one hundred per cent, the greatest loss usually occurring soon after the first growth of



Fig. 18.
Canker-eye—from natural injection with chicken pox virus.

scabs is removed. After removal, the scabs are thoroughly dried and reduced to a fine powder by grinding in a small coffee mill, and then in a ball mill for twenty-four to forty-eight hours. This powdered virus if perfectly dry, will keep for months and may be stored in sterile bottles until needed in preparing vaccine. High potency of the virus is maintained by keeping fowls constantly inoculated and using for inoculation purposes fresh dried scabs from severe cases, and by occasionally securing new strains of virus from naturally infected birds.

"Method of Preparing Vaccine: One gram of the powdered dessicated virus to 100 mils of physiological salt solution is the proportion used in making vaccine. This proportion was adopted after making numerous trials with varying amounts of virus. Aseptic precautions are observed. The virus is first weighed out and placed in a sterile mortar with a sufficient amount of sterile salt solution to make a paste, and ground for at least five minutes or until the mixture acquires a smooth cream-like consistency. Four or five mils of sterile salt solution to each gram of virus is required for this purpose. To this mixture is then added sufficient sterile salt solution to bring the volume up to 80 mils. It is then poured into a sterile flask or bottle, placed in a water bath and heated at a constant temperature of 55 degrees C for an hour. It is then filtered through sterile cheese cloth into a sterile flask or bottle and to it is added 20 mils of sterile salt solution containing 1 per cent of tricresol which mixture is poured through the filter so as to wash out as much of the pulverized material as possible. After cooling in running water or ice water until the temperature is below

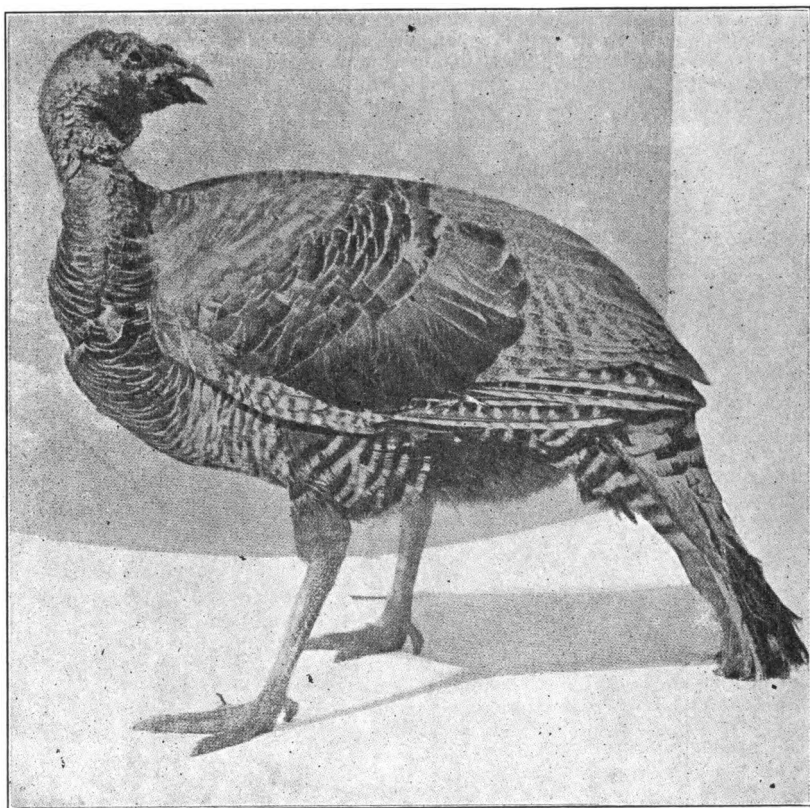


Fig. 19.
Pox on turkey—natural infection.

7 degrees C the vaccine is ready for transfer to the ultimate containers which are sterile bottles of amber or other dark glass. The vaccine may retain its potency for more than a month after preparation and on the other hand it may become less effective within two weeks. Therefore vaccine should be used as soon after preparation as possible.

"Efforts to Standardize the Vaccine: Our experiments have shown that the immunizing value of vaccine varies directly as the virulence of the virus contained therein. Since there is a variance in the virulence of different lots of virus there is necessarily a variance between different lots of vaccine. Thus far all attempts to devise a method of standardizing the virus in vaccine have proved unsuccessful. These have included the complement fixation test, inoculation of fowls with vaccine by scarification of the comb, and the intracutaneous injection of vaccine. The complement fixation test proved to be entirely inapplicable. Vaccine capable of producing marked lesions on fowls inoculated by scarification of the comb produced a higher degree of immunity in fowls vaccinated than vaccine capable of producing only mild lesions. At present, however, it is not possible to determine, by observing the lesions produced on fowls inoculated with vaccine, the degree of immunity it may be expected to produce in fowls vaccinated. The intracutaneous injection of vaccine gave no determinative reaction.

"Efforts to Improve the Vaccine:—Various attempts were also made to increase the efficiency of the vaccine by improving upon the method of preparation. The use of glycerine in the preparation of vaccine did not produce a more satisfactory product. Vaccine prepared in the usual manner, but not heated, proved to be an efficient immunizing agent, but it also produced disease in more than fifty per cent of fowls vaccinated. For this reason such vaccine cannot be used. A shake-extract of powdered virus was found to be an efficient immunizing agent when fresh, but it did not retain this property sufficiently long to make such a lengthy method of preparation practical. Powdered virus made in the form of "pills" and given subcutaneously conferred no immunity. The intracutaneous injection in the wattle of 1-10 mil doses of regular or shake extract vaccine proved to be a very efficient means of immunization. However, the development of lesions at the injection point and elsewhere about the head, and areas of induration at the point in the wattle make this method both dangerous and objectionable.

"Method of Administration:—The vaccine is administered subcutaneously. The dose is one mil for each bird. The most convenient place for administration is beneath the skin of the breast under the right thigh, the skin at that point being comparatively free from feathers. Special precautions must be taken that the vaccine is injected *just beneath the skin, not into the breast muscle*. The bird may be held either by the operator or by an assistant. *When the operator holds the bird*, the left wing is held back, the fowl is laid on its left side, and the right wing and leg and feathers held back with the last three fingers of the left hand. The exposed skin is then cleansed with a piece of cotton saturated with disinfectant solution (2 per cent solution of compound solution of cresol) and picked up with the thumb and forefinger of the left hand. Then with the right hand the syringe needle is inserted *just beneath the skin* and the proper dose injected. With a little practice one man with an assistant to catch the birds can vaccinate from 100 to 150 per hour.

"When an assistant holds the bird, both wings are grasped with the left hand and both legs with the right hand. The bird is then laid on its left side with the breast toward the operator. The operator standing a little to the rear of the bird, cleanses the skin at point of injection, picks it up with the thumb and forefinger of the left hand, and with the right hand inserts the syringe needle *just beneath the skin* and injects the vaccine. By this method a man with two assistants to catch and hold the birds can vaccinate from 200 to 300 per hour.

"A syringe of six to twelve mls capacity is well suited for this work. The needle should be 16 to 18 gauge and from 1½ to 2 inches over all in length. A screw needle is preferable.

"One treatment is usually sufficient in healthy or slightly infected

flocks. In badly infected flocks a second treatment for all birds is advised. In very severe outbreaks the injections should be continued at intervals of 5 to 7 days until the disease ceases to spread.

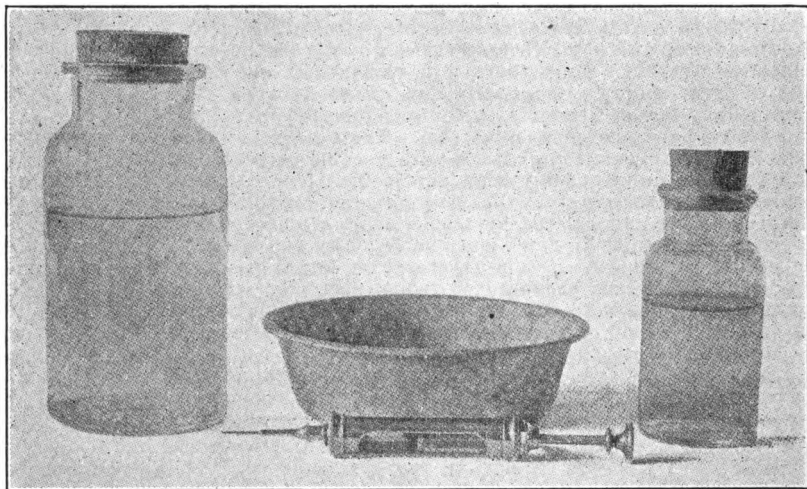


Fig. 20.

Apparatus required for vaccination: 1, Large bottle of vaccine. 2, Pan of disinfectant for cleansing the skin at the point of injection. 3, Hypodermic syringe. The syringe shown is of 6 cc. capacity and provided with a burr on the plunger to regulate the dose. 4, Small bottle of vaccine from which the syringe is filled.

*“Effect of Vaccination on the Fowls:—*Chicken pox vaccine if properly administered never has any harmful effect. We have occasionally observed a slight depression following vaccination which lasted for one or two hours, but as a rule there is no reaction. The vaccine has no harmful effect on the growth or development of growing stock and therefore it can be safely used on birds of any age. Vaccination does not influence egg production. There may be a slight decrease in egg yield following vaccination, but this is no greater than would result if the fowls were handled for any other purpose. Therefore there need be no hesitancy about vaccinating a heavy producing flock.

“The Protective Value of Chicken Pox Vaccine: We have found that partial or nearly complete protection against severe artificial infection with chicken pox virus may develop in two to six weeks after vaccination. Some lots of vaccine afford nearly complete protection while with other lots the protection is less marked, and with still other lots very slight. The amount of protection afforded was measured in all cases by comparing any lesions on vaccinated birds produced by the inoculation with those produced on an equal number of non-vaccinated control birds inoculated with the same virus. This variation in the protection afforded by different lots of vaccine is explained by the previously mentioned variation in virulence of different lots of virus.

“It would seem very probable, however, that the resistance to artificial infection produced by the vaccine is sufficient to protect against natural infection which could not be as severe as the artificial infection. A series of experiments were conducted in which an aggregate of twelve hundred and ninety-eight birds were used, two hundred and seventy-two of which were naturally infected with chicken pox. Nine hundred healthy fowls were vaccinated and one hundred and twenty-six healthy fowls were not vaccinated. None of the diseased fowls were removed from the flocks after vaccination; thus affording every opportunity for the then healthy fowls to become in-

fected. It was positively known that none of the healthy fowls had been previously infected with chicken pox. All fowls were leg banded and therefore an accurate record of the condition of each fowl could be kept. Frequent examination of each fowl showed the following: Of the vaccinated healthy fowls eleven per cent subsequently became diseased. Such results seem to us exceedingly good evidence of the protective value of chicken pox vaccine against natural infection.

"The results of experiments to determine the length of the immunity have indicated that it may vary from nine months to more than two years. Field observations show, however, that the immunity may last no longer than two or three months. On account of the uncertainty in regard to the longevity of the immunity produced, it is recommended that flocks be vaccinated only to prevent the spread of infection already present and not for the purpose of immunizing them against subsequent infection.

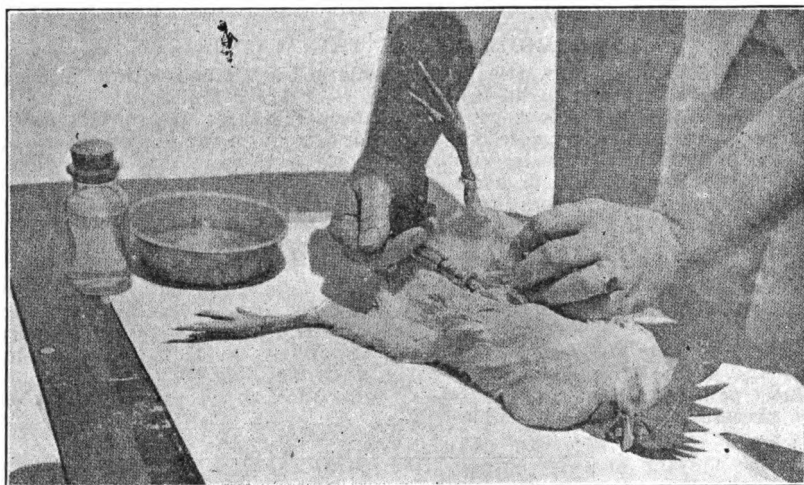


Fig. 21.

This figure shows the method of holding a fowl and administering chicken pox vaccine.

"Conclusions:—In concluding this discussion it is desired to emphasize the following points:

"1. As they exist in California, there does not appear to be any etiological relationship between chicken pox and those pathological conditions of the nasal passages commonly designated as colds, roup or swelled-head.

"2. Many so-called 'outbreaks of roup' may in reality be a disease manifested by symptoms very similar to roup, but due to nutritional factors.

"3. There appears to be ample evidence that chicken pox and those pathological conditions of the mucous membranes of the mouth and eyes commonly designated as canker or avian diphtheria are etiologically identical.

"4. Vaccine prepared from desiccated chicken pox virus while not conferring, in the majority of cases, complete protection against severe artificial infection does confer a considerable degree of resistance. This is shown by the mildness of lesions produced by inoculating vaccinated birds with virus as compared with those produced by inoculating non-vaccinated control birds.

"5. Chicken pox vaccine has proved to have considerable curative value when used on diseased birds.

"6. Chicken pox vaccine has proved a very effective means of promptly checking outbreaks of chicken pox and canker. The use of this product has become very general among poultrymen of California.

"7. The length of immunity produced by chicken pox vaccine may vary from two months to more than two years. For this reason the vaccine is recommended only to check the spread of the disease in flocks already infected.

"8. The efficiency of chicken pox vaccine is dependent upon the degree of virulence of the virus contained in it. Since there is considerable variation in the virulence of different lots of virus and there is at present no method of standardizing the virulence of virus, there is necessarily considerable variation in different lots of vaccine.

"9. It is realized that the present method of preparing chicken pox vaccine is very imperfect. Thus far, however, all efforts to devise a better method have proved failures."

This vaccine of Dr. Beach's is not available to poultrymen outside of the State of California. Most of the commercial vaccines which are on the market are not dependable. The vaccine may be obtained from the state departments of some other states, but we have heard of none that have met with the same success that Dr. Beach has.

ENLARGEMENT OF THE WATTLES

SYMPTOMS:—The wattles become enlarged and filled with a fluid or a pus, either as a result of an injury, cold weather or a disease.

TREATMENT:—Adopt general sanitary measures. Open the wattles at the lowest point. Squeeze out the fluid, or remove the pus or cheesy material. Place the wattles in cup of warm water to which has been added a little zenoleum, creolin, or some good disinfectant. Knead it gently with your finger until it appears to be thoroughly cleaned. In some cases cropping of the wattles is recommended.

ABSCESS OF WATTLES

Trouble of this sort is not uncommon. Make an opening in the lower portion of the wattle, so that it may discharge freely if necessary. Thoroughly cleanse the parts with hydrogen of peroxide and water, equal parts. If this does not prove effective, use full strength peroxide. After cleansing, dry the parts thoroughly and apply an ointment made by mixing one part finely powdered iodoform with twenty parts vaseline. Daily treatment will be necessary.



Fig. 22.
Enlargement or Dropsy of the Wattles.

QUESTIONS ON LESSON 26

POULTRY DISEASES, THEIR CAUSES, PREVENTION AND CURE

1. What are the principal causes of diseases of poultry?
2. Mention some of the essentials for prevention and for maintaining a healthy flock.
3. Why is it important to detect disease and diagnose it in its earliest stages?
4. What effect does breeding have on the health of a flock?
5. State briefly how you would make a post-mortem examination.
6. Why should the sick birds be isolated? How should they be housed and fed?
7. Should the buckets, fountains and pens used with sick birds be used with other birds? Why?
8. How would you proceed to give your poultry house a thorough cleaning and disinfecting?
9. How does chicken pox affect fowls?
10. If you should discover a bird with a frozen comb, what would you do in order to save the comb?

BLINDNESS AND STAGGERS

The above illustration shows a hen which was in good healthy laying condition, but lost her sight seemingly without cause. She was trained to eat and drink and move about in her room. She continued to lay for some

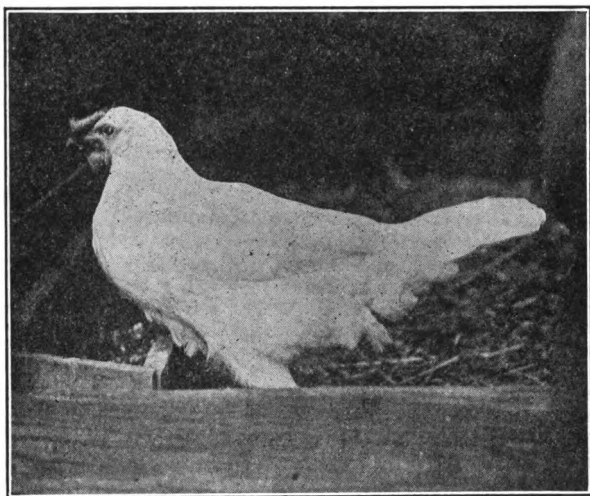


Fig. 23.

Blind hen, caused by a blood clot pressing on the brain. The clot may have been caused by a knock on the head or the rupture of a blood vessel.

time, until another disease caused her death. A post-mortem examination revealed the fact that a blood clot had formed at the base of the brain, which evidently caused her blindness. A severe knock on the head frequently causes an unsteady motion of the body or head and neck.

BUMBLE FOOT

Bumble foot is caused by bruises on the bottom of the feet, too narrow or rough roosts, or an injury to the foot. If the roosts are too high and the birds are compelled to jump from the high roost to the floor, they often bruise their feet in this way. These bruises frequently swell and become

filled with pus, and, if not lanced, the pus becomes cheesy and forms into a hard lump, which becomes a permanent enlargement. The pus cavity should be opened with a sharp knife, washed out with carbolized water, or some disinfectant solution or peroxide, and the entire surface of the cavity itself painted with a solution of nitrate of silver—10 grains to 1 oz. rain water. The foot should then be poulticed and wrapped, to prevent filth and dirt from getting into the opening which has been made. Keep the bird in a quiet, comfortable place until it recovers. If the blood flows too freely, tie a string tight around the leg to prevent the flow.

LEG WEAKNESS OR RHEUMATISM

The term "leg weakness" is sometimes used by poultrymen to indicate the lameness due to rheumatism in adult birds. The more usual use of the term "leg weakness" is to denote a disease or ailment which is found in growing chicks from one month to six months of age. It is said to be more common among cockerels than pullets, and is more frequent in the heavier than in the lighter breeds. The chief cause of the trouble seems to be that in birds growing rapidly and fed heavily their weight sometimes increases faster than their strength. This results in a weak-kneed, wabbling bird. The disease is sometimes ascribed to other causes, such as over-crowding, close unventilated quarters, over-heating, forcing, or too much fattening food, etc. Salmon says: "It may develop in young chickens kept in brooders in which the heat is not properly distributed or where there is too much bottom heat, also in those which are kept constantly upon wooden floors." Regarding these cases, Robinson says: "Where such conditions are present the leg weakness is more likely to be an accompaniment of disease which plainly shows other symptoms."

The symptoms are indicated in the name of the disease. It first appears as an unsteadiness in the walk. This may gradually become worse until the bird is unable to stand alone and is constantly tumbling over. The birds are found sitting while eating and are inclined to walk very little. When the trouble first appears there is little else wrong with the bird. The eye and comb are bright and healthy, the appetite good. Later, however, the bird, weaker than the others, gets less grain and becomes thin, feathers out poorly and is an object in distress. It is said that rheumatism can be distinguished from leg weakness by the swelling of the joints in the former disease.

TREATMENT:—This consists chiefly, of course, in removing the cause. Since the most common cause is the overfeeding of fat producing foods, the amount of these should be reduced. The weak birds should be removed to a pen by themselves. Substitute bran, wheat and oatmeal for the corn and corn meal. Give skim milk, if possible, instead of water. Feed plenty of green food. This is one of the most important measures. Sanborn recommends rubbing the legs with tincture of arnica and adding one-half teaspoonful tincture of nux vomica to each quart of drinking water.

LEG WEAKNESS IN YOUNG CHICKS, DROOPED WINGS, SORE EYES, LOW VITALITY

Some interesting discoveries on treating leg weakness, drooped wings, sore eyes, weakness and low vitality in baby chicks have recently been made. Chicks often develop rapidly until the age of about 10 days, when suddenly a reaction will be noticed. In most cases green food is neglected with the result that many chicks die, while others frequently go into convulsions and the balance of the flock show signs of weakness. Tomato juice can be administered with exceptional results. In less than 24 hours every chick will show some improvement and practically the entire flock can be saved.

The Ontario Agricultural College has conducted an extensive experiment on the relative value of tomato juice in reducing the mortality among chicks and promoting growth. During March 2,000 chicks were hatched and placed in this experiment. Careful records of weights attained at successive periods during the growing period were registered and it was found that the growth of this lot was 13 per cent above the normal growth curve. It has also been found that tomatoes contain three of the essential vitamins found in our best foods. The acid in the tomato helps preserve those vitamins.

As far as poultry is concerned and the value of tomatoes as a food for poultry was discovered in the following manner:

"Two years ago the college authorities at Ames, Ia., were carrying on some experiments to discover how long calves would live and how fast they would grow if fed on cows' milk alone. The calves came along splendidly until they were about six months old when rickets, a malnutrition ailment that showed itself in a softening of the bones, would develop, and each affected calf would die in two or three days after the disease made its presence apparent. After several calves in the test had died, another one developed the trouble, and its death was expected. Accidentally or otherwise, a can of tomatoes was spilled into the feed of milk, and milk and tomatoes were given to the calf. The herdsman was surprised next day to find it had recovered entirely, and was apparently as well and strong as ever. Tomatoes were mixed with the milk in feeding the calves from then on, and no more of the calves died.

"Rickets in calves and leg and wing weakness in chicks are kindred troubles, and what would prevent the one would likely prevent the other..

"In the above feeding tests, the first feed was made of equal parts of cornmeal and wheat shorts, moistened sufficiently with tomatoes—the kind you buy in tins at the grocers—to make it crumbly. The second feed was also cornmeal and wheat shorts, but moistened with equal parts of buttermilk and eggs. These two mashes were alternated for the first six or eight weeks, nothing else except buttermilk to drink being given. No scratch grains whatever were fed. The mashes were given on pieces of boards, some rolling into the alfalfa litter which covered the floors. This the chicks later found amusement and exercise in scratching for.

"Careful records of the weights attained at successive periods by the chicks were kept, and it was found that the growth of this lot was steadily 13 per cent above the normal curve.

"This increase in growth rate, of course, was most satisfactory, but there still remained the more important result that mortality was practically wiped out and no cases of leg weakness or drooping wings developed."

TOMATOES, EGGS AND MILK

It will be noted above that not only was tomatoes and tomato juice fed in the moistened mash, but a mash was also moistened with egg and milk. It is the yolk of the egg in most cases which is the most beneficial part of the egg in feeding for such results. In many cases, where chicks showed a tendency to low vitality, slow growth, drooped wings and leg weakness, we have been able to correct this trouble entirely by feeding milk and eggs beaten together and moistening a mash with it. In some cases it is necessary to force the egg and milk liquid mixture down a bird's throat if it is a valuable bird and individual treatment is justified. In addition to this, give tender lettuce, green clover or alfalfa, rape, kale or tender green feed, all the birds will eat. Now tomatoes are recommended and we recommend them especially in growing young chicks.

Ninety-nine times out of a hundred, if the chicks show signs of leg weakness, drooped wings, slow growth, or weakness of any kind after they are two weeks to two months old, the trouble is largely due to lack of tender greens, lack of vitamins, lack of proper food and nourishment, or to mites or overcrowding.

Among the most important, as well as most interesting discoveries made during recent years is the fact that there are certain substances, minute in quantity but absolutely necessary to nutrition, and to these substances the name "vitamine" has been given. They have never been isolated and we can only guess at their real nature. But the fact that tomatoes contain three of the four known vitamins is the reason that the chicks in the above experiments responded in such a marked degree to the use of tomatoes in their food.

VALUE OF VITAMINES

Poultry keepers of experience know the value of green vegetable foods for poultry. In giving advice we have invariably said to give the fowls all the green food they will eat in addition to their regular supply of grain. It

has always been our experience, ever since we studied the subject closely, that green vegetable foods were necessary for the best results in egg production, in growth, and in bringing show birds to the highest state of perfection, but it has been only during the past few years, since we first became interested in vitamins, that we recognize an advantage in feeding vegetable food in addition to the assistance they afford to digestion, and the nutrient they convey. We were informed that vitamins are not found in the seeds of plants, at any rate in sufficient quantities to render them valuable on that account (and seeds of plants include all the grain, wheat, corn, etc., that is fed to fowls). We were informed that vitamins are to be found in the leafy portions of the plants and presumably in the so-called "flesh" of the tomatoes, and probably in the skins.

EXPERIMENTS WITH PIGEONS

Colonel Robert McCarrison, Fellow of the Royal College of Physicians, London, states that "the vitamins contained in natural foods are essential to health." He said there was an abundance of vitamins in fresh fruit and green, leafy vegetables, and recommended eggs among other products containing vitamins.

"While in the Himalayas for a number of years, Dr. McCarrison said that with 400 major operations in a year, there were no cases of appendicitis or colitis. This was because the natives lived on natural foods. In making experiments in diet on monkeys, he found that the *devitaminized* food resulted in degenerated tissues and a general breakdown in health. The instinct of the monkey was so strong for the right kind of food that it would try to discover particles of food not devitaminized. Monkeys at the zoo in London had turned away from delicacies to take cabbage leaves.

"Experiments on pigeons led to the same conclusions as to the value of vitamins. A pigeon fed on polished rice for 15 days lost its strength completely, but upon being given essence of vitamins, it recovered in less than 12 hours."

HATCHABILITY OF EGGS, AND STRENGTH OF CHICKS

Professor J. S. Hughes, J. B. Fitch and H. W. Cave, of Kansas State Agricultural College, "declared that the vitamin content of milk or eggs is determined largely by the quantity of vitamins in the feed given the cows or hen producing the milk or eggs."

"In other experiments they discovered that eggs of low vitamin content laid by hens fed on low vitamin food produce chicks that are not strong and vigorous. This fact, rather than the commonly blamed methods of incubation, may account for a large portion of the annual loss of half the eggs that the poultryman sets each year. Probably 300,000,000 eggs out of the 600,000,000 set each year in this country fail to produce strong chicks, and this represents a loss of over \$12,000,000 a year.

"These results indicate that as a rule the animal organism does not synthesize vitamins, but must obtain them from its food. If this is generally true, as seems probable from the experiments reported, it will not always be sufficient that the mother is nursing her baby, but she must be sure that she is obtaining sufficient vitamin-containing foods.

VITAMINES A RECENT DISCOVERY

"Vitamins, or the lack of them, began to bother people's minds only a little over a decade ago. At that time investigations were made of the disease beri-beri, which occurred among people who consume rice as their chief article of diet. It was found that the disease could be prevented by adding to the polished rice the polishings or surface layers of the grain which were removed by the modern milling methods just introduced.

"That the lack of something could make a person sick was a new idea. People had grown to believe that if they had kept out of the way of germs they would be safe. Now three well characterized vitamins are differentiated. They are the water soluble antineuritic vitamin, which Dr. Seidell is attempting to isolate, the fat-soluble, growth-promoting vitamin, and the antiscorbutic vitamin, which occurs in fresh cabbage, orange juice, tomatoes, etc., and prevents scurvy."

Let us repeat the advice which we have urged so often—give your chickens and mature fowls all the green vegetable food they will eat in addition to their ordinary rations.

NAKEDNESS IN YOUNG CHICKS

Some young birds have a tendency to grow bone and muscle instead of feathers.

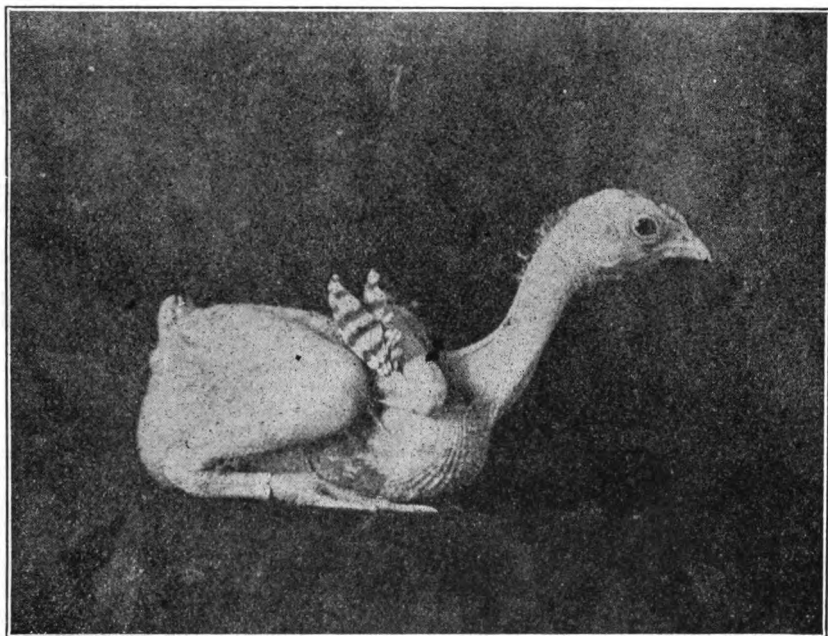


Fig. 24.

Featherless Chicks. Usually caused by breeding from immature stock, or breeding from male or female that was affected in the same way when a chick. They are always poor laying stock when mature.

This Barred Plymouth Rock is a very good example. However, it may appear in any variety of birds, especially when growing rapidly and while young.

This fault may be overcome partly by feeding, but the greatest influence is through the breeding stock, as some strains have a tendency to develop naked cockerels. This may be caused by breeding from immature stock. Never use a male to breed from that was thus affected. Feed plenty of bran, oats and other feather building materials. Mix a few drops of carbolic acid with vaseline and rub the skin of the bird several times a week. Such birds as this should be marketed as soon as old enough. Poor laying strains of any variety always have this fault to a greater or lesser degree. We never saw a cockerel so affected, breed any good layers.

BOILS ON THE SKIN

Where birds are slow to feather, we often find that some of the feathers curl up under the skin, which causes boils or running sores to form on the skin. The young, growing feather curls up and causes an ulcer or festering place in the skin. Never breed from such a bird. Rub the skin each day with a salve made of powdered sulphur and vaseline. Add 6 to 8 drops of carbolic acid to each tablespoonful of this sulphur and vaseline mixture. Rub the skin daily with it.

BALDNESS OF HEAD

Many people write to know if some mite or some disease is responsible for baldness of the heads of their females during the spring months. Of course, depluming mites could produce such a condition, but as a rule this is not caused by mites or disease, but is due to the vigor of the male bird in treading the females. This is seldom noticed except during the breeding season and usually occurs during the laying period. It is usually noticeable on the best laying hens. In all such cases, simply keep on the lookout for the real trouble, but I would not regard a few cases of this kind with any degree of seriousness. If you think it is due to a skin disease of any sort, then rub the parts with a salve made of vaseline and powdered sulphur, and add about ten drops of refined carbolic acid to each teaspoonful of the salve.

FEATHER EATING

This habit is usually caused by idleness of the fowl and improper methods of managing your birds. Encourage your fowls to take exercise by feeding most of your grain in a litter. Feed abundance of succulent tender green food. The birds should also have access to beef scraps or meat food of some sort, such as milk, sour milk or buttermilk or green cut bones. If these are not available it is a good idea to boil fresh bones and make a soup with which to mix a moist mash, which should be fed to the birds daily. Spade up a few shovels of earth occasionally and encourage the birds to work in that. If you find that the birds persist in feather eating, it is a good idea to tie a few small pieces of meat on the end of a string and hang the same from the roof so that the birds have to jump to reach them. As soon as the trouble is noticed it is a good idea to go into the pen and try to spot the birds that have formed the habit, and take a sharp knife and trim both lower and upper parts of the beak until they bleed just a trifle. Make the point of the beak square and blunt so that the birds can not get a firm hold on the feather in the attempt to pull same. Discourage idleness all you can, and if you follow the above directions it will break the birds of this ugly habit of eating feathers. Feed liberally.

EGG EATING

This is rather a bad and expensive habit, and if it develops to any extent it is usually the fault of the poultryman himself. The nests should be kept supplied with a liberal supply of nesting material of some sort so that the eggs will not break when they are laid. The nests should also be protected from the light by being placed and kept in the darkest part of the room. Never allow your nests to be placed on or near the floor where the eggs must continually tempt the hens, and where there is danger of the birds coming in contact with broken or soft shell eggs. If your fowls have developed this habit, place a few china or artificial nest eggs about the floor of your poultry house so that the hens can work at these. Blunt the beak of the birds that have developed this habit by trimming the point until the beak is square and blunt. Give a good supply of a good grade of oyster shell, limestone grit, and provide the birds with tender, succulent green food, and meat food of some sort. If necessary, you may provide your birds with lime water as a drink. Milk, buttermilk or sour milk are also beneficial in such cases. Encourage activity and feed liberally.

In some cases we have found by feeding the birds liberally on dry or ground up egg shells, they will soon overcome this habit. Save the shells of eggs that are used for cooking purposes or even the shells of infertile eggs that have been in incubators; dry these thoroughly so that they will become crisp and will crumble easily. Mix the particles of the broken shells with the dry mash given the birds.

FAVUS

This is a disease that affects the comb, face and wattles. It starts by a crust forming on the unfeathered portion of the head. It often extends down onto the feathered portion of the head and neck and in the region of the vent. The feathers fall off, and the head and neck and patches around the

vent become bare. A peculiar odor can be noticed, resembling must or mold. When the disease first starts you do not notice much change in the general health of the fowl, but as the disease progresses, the bird will begin to go down, will lose its appetite, will grow thin and finally die. It is caused by a fungus.

TREATMENT:—Remove as much of the crust as you can, using the back edge of a knife or a spoon handle. Before doing this, soften the scales with water, or by rubbing on oil or glycerine. The parts should then be painted with tincture of iodine. A mixture of equal parts of lard and sulphur, with a few drops of refined carbolic acid mixed in, will make a good salve which should be rubbed on the affected parts and around them. Use this once a day. The disease is contagious and the affected birds should be removed from the flock, and every precaution taken to prevent the spread of the disease.

DIAGRAM SHOWING THE INTERNAL ORGANS OF A HEN

- | | |
|---------------------------------------|---------------------------------------|
| 1. Is tongue and glottis at the back. | 12. Kidneys. |
| 2. Esophagus. | 13. Trachea, or Windpipe. |
| 3. Crop. | 14. Lungs. |
| 4. Stomach and Proventriculus. | 15. Heart. |
| 5. Gizzard. | 16. Spleen. |
| 6. Pancreas. | 17. Ovary. |
| 7. Liver. | 18. Funnel of oviduct. |
| 8. Intestine. | 19. Albumen section of oviduct. |
| 9. Caeca. | 20. Isthmus of oviduct. |
| 10. Rectum. | 21. Shell forming section of oviduct. |
| 11. Cloaca. | |

This picture is from a photograph of the internal organs of a hen as they were spread out, showing the relative size and length of the different organs. It must be noted, however, that some organs, such as lungs, kidneys, etc., collapse upon being removed from the body so that they are not as large as when in the body.

Three important points are clearly shown. First, the relation of crop (3); stomach (4); gizzard (5), and pancreas (6). Second, the relation of the different parts of the egg producing organs, 17, 18, 19, 20 and 21. Third, that the cloaca (11) is the common opening for 10, 12 and 21.

No. 1 is the tongue and glottis; the tongue is used to move food about in the mouth, throws it back into the esophagus and aids in drinking. The glottis is the opening from the mouth into the trachea or windpipe and helps to control the voice.

No. 2—The esophagus is a tube-like passage for the food to pass from the mouth into the crop and from the crop into the stomach.

No. 3—The crop is an enlarged part of the digestive tract where the food is stored and mixed with liquid until the harder parts are softened; from here it gradually passes into the stomach.

No. 4—The stomach (proventriculus) corresponds with the stomach in the human being, as the gastric glands are located here. These glands secrete the first digestive fluids, pepsin and hydrochloric acid, which act upon the food.

No. 5 is the gizzard, where the grinding or crushing of the food is done. Here the digestive fluids continue to act upon the food and the entire contents are mixed into a pasty mass.

No. 6 is the pancreas, the gland that secretes the digestive fluids which, with the bile, completes digestion.

No. 7—The liver is the largest gland in the body. It secretes the bile which aids digestion, emulsifies and saponifies the fat. The liver is also spoken of as the storehouse of food. Sugar in a certain form is one of the foods thus stored, which is later used as food for other parts of the body.

No. 8—The intestines and (9) caeca are principally for the absorption of the nourishing parts of the food, although a great part of the digestion takes place in the first part of the intestines.

No. 11—The cloaca or common opening into which 10, 12 and 21 empty. The contents of 10 and 12 are usually voided together, the white, chalky portion being from the kidneys.

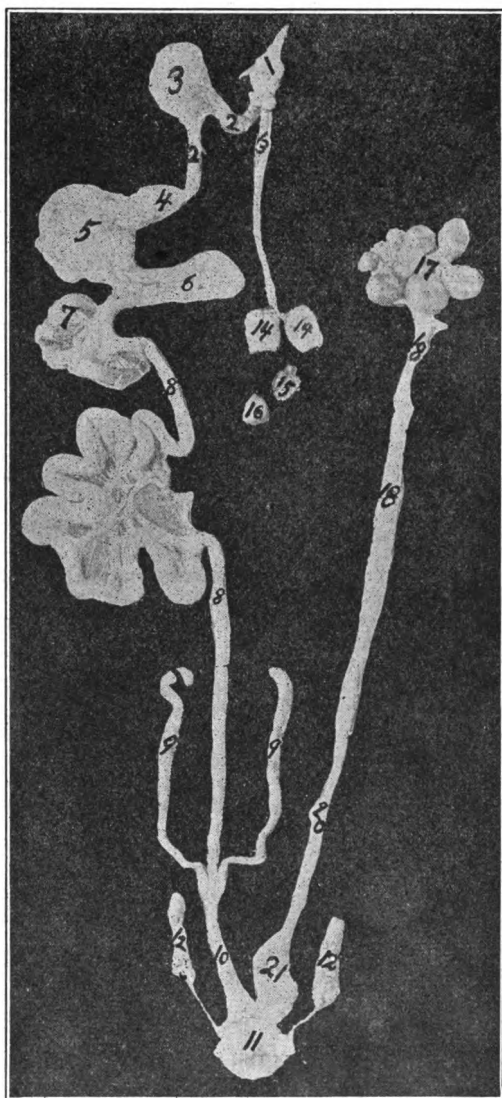


Fig. 25.
The internal organs of a hen.

No. 12—The kidneys, which take up and cast out many impurities from the body; mostly nitrogenous substances and salts.

No. 13—The trachea, which conveys the air to and from the lungs, (vocal cords).

No. 14—The lungs, where the blood is purified.

No. 15—The heart, which pumps the blood to all the different parts of the body.

No. 16—The spleen is the least known organ of the body, but is thought to be the place where red blood corpuscles are buried, repaired or manufactured. It is also one of the great glands to produce anti-bodies or antitoxins to protect against disease.

No. 17—The ovary is where the ovules, or yolks of eggs are developed.

No. 18—The funnel of the oviduct, which picks up the yolks as they are freed from the ovary.

No. 19—The part of the oviduct where the albumen or white is secreted and placed around the yolk.

No. 20—The isthmus of the oviduct is where the soft shell is placed around the egg.

No. 21—Uterus, the section of the oviduct where the hard shell is placed around the egg.

No. 22—Vaginal portion of the oviduct, which contains the so-called sphincter muscles which protect the contents of the cloaca from passing into the uterus.

THE TRACHEA OR LARYNX AND HOW THE VOICE OF THE FOWL IS PRODUCED

"C" is the opening of the larynx and is just back of the base of the tongue.

"A" is the membranous or muscular part of the opening which contracts and closes the opening when food is swallowed. It corresponds with the epiglottis in man. The contracting and closing of these muscles and the relaxation and the opening have some influence on the voice. It modi-

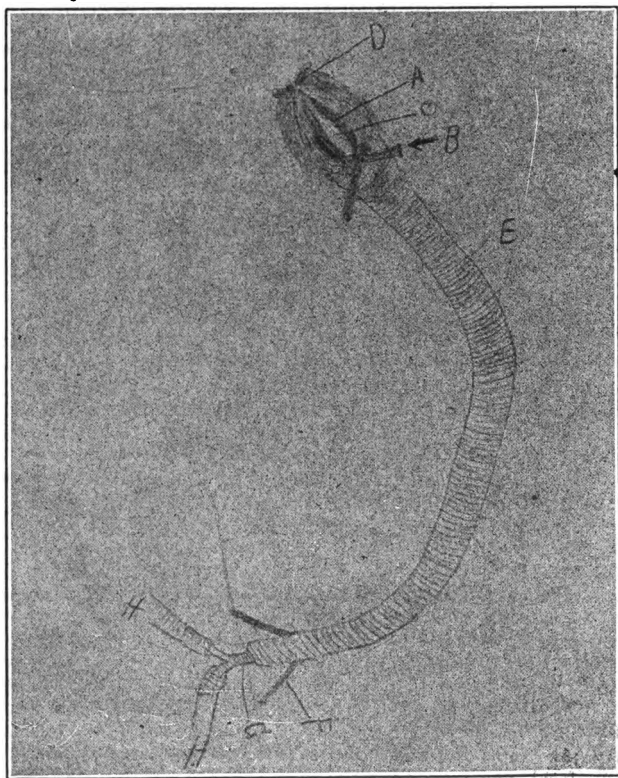


Fig. 26.
Trachea.

fies the sound. It is the opening and closing of this membrane and the opening and closing of the mouth, with the extension or lengthening or shortening of the trachea by which the sound is modified that make the cackle or the "ka, ka, kea" of the hen or the crowing sound of the rooster. The membranous or muscular part ("A") does not produce the sound, as is commonly supposed by most persons, but this simply aids in controlling the sound, much the same as the lips of a human. The tube-like part of the trachea is made up of cartilaginous rings attached to each other by thinner membranes as seen at "E." This allows the trachea to be made longer or shorter and this aids in modifying the sound or voice. The sound is not produced by vocal cords at the opening of the larynx, but it is produced by constriction at the lower end of the trachea at "G." It is just before the bifurcation into the two large bronchi. The rapid passing of air through this constriction produces the sound or voice. In geese and ducks there is, in connection with the construction, a dilation to produce more volume of sound.

"F" is a muscular attachment. As the muscles contract the trachea lengthens, and as said before, the voice modifies in this way to some extent.

"D" and "B" are also muscular attachments and aid in opening and closing the trachea, and in drawing up the trachea to lengthen it.

CROUP, BRONCHITIS OR PNEUMONIA

SYMPTOMS:—With these diseases there is an inflammation of the mucous membrane of the throat and bronchial tubes. You will notice the the bird breathes rapidly and often makes a rattling, bubbling, or whistling sound. In very severe cases the bird may breathe with some difficulty, refuse to eat, and wings droop. It may be caused by exposure to cold, drafts or dampness. It may result from inhaling dust.

TREATMENT FOR BRONCHITIS AND PNEUMONIA

One of the best remedies we have ever used for Bronchitis, Pneumonia or an apparent irritation of the throat and bronchial tubes is an ointment made as follows:

Fry four mullein leaves in one and one-half tablespoonfuls of lard and one-half tablespoonful of tallow. If you haven't tallow then use all lard. After the mullein leaves have been fried and the mixture allowed to cool until it is in a luke-warm state then we mix in one teaspoonful of Turpentine, one teaspoonful of Camphor and one teaspoonful of Iodine. See that this is thoroughly mixed with the lard, etc., then rub the throat each night and morning, both inside and out, with the mixture.

In case of Pneumonia it is also a good idea to rub some of this remedy underneath the wings and just over the lungs. This seems to help cases of Bronchitis and Pneumonia when nothing else does. Also rub these parts with a mixture of pure lard and Turpentine. This will sometimes prove quite beneficial. Use about one-half tablespoonful of Turpentine to each tablespoonful of lard. Melt this and see that it is thoroughly mixed before applying.

OTHER TREATMENTS:—Keep the bird in a comfortable, dry room or coop which is well ventilated. Lots of pure, dry air will do as much to relieve these diseases as any treatment you can give. Feed a mash moistened with milk. We make a mixture in the following proportions: To each teaspoonful of castor or olive oil we add ten drops of turpentine and five drops of either syrup or wine or ipecac. Mix well and give one teaspoonful twice a day until the bird shows signs of improvement. This trouble is very difficult to control or relieve. Don't give oil to the extent that you purge your birds too freely.

You can also cure some of the cases by giving tincture of aconite, one drop to each fowl, every two hours. Put the food containing aconite down the bird's throat if necessary. Drop the aconite in a little mash and feed every two hours.

In case of pneumonia, it is advisable to raise up the wings and paint the skin, just over the lungs, with tincture of iodine. To stimulate the birds,

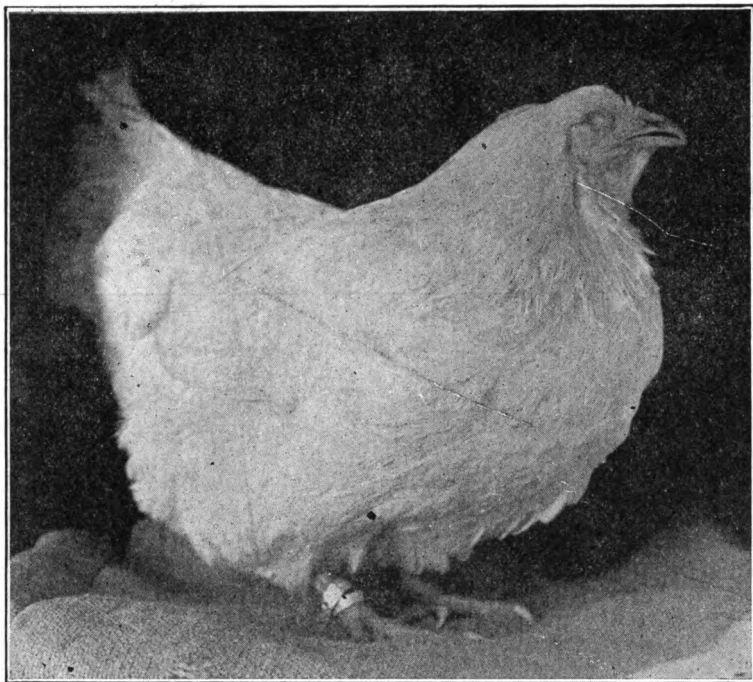


Fig. 27.
PNEUMONIA.

A fine, large hen which has contracted pneumonia because of exposure and damp roosting quarters.

it may be necessary to use two drops of spirits of camphor and ten drops of brandy in a teaspoonful of warm milk three times a day.

If you cannot get the rattle in the throat stopped in any other way, we advise putting a little powdered sulphate of iron (copperas) in a glass tube or paper rolled up to form a tube. Blow this into the bird's throat. Also keep a preventive in the drinking water at the time this remedy is used.

COLDS, CATARRH AND ROUP

We doubt whether at any one place in the world have there been more roup remedies and preventives tested and experimented with than we had tried out at the Missouri State Experimental Station. Roup is one of the sources of loss of mature fowls. Much of this trouble can be avoided by proper methods of prevention.

We believe that serums can be made so that flocks can be inoculated and made practically immune to roup. We have been testing out something along this line, but have not arrived at any definite conclusion, except that we believe this is the only sure way of really preventing and curing a large per cent of the cases of roup.

As we have often stated, we do not recommend doping your fowls with anything so long as they show no indications of disease, but if you have many cases of roup we recommend the use of the treatment which we have found to be most effective. These remedies can be used with considerable success until such time as we are able to develop a serum or some more simple and practical method of prevention and treatment.

SYMPTOMS:—Common colds are caused by exposure to cold, damp winds, stormy weather, drafts, overcrowding, poorly ventilated houses, and other similar causes. When colds first appear, you will notice the birds sneezing, bubbles in the corners of the eyes, a watery or sticky discharge from the nostrils and eyes, which the birds persist in wiping off on the feathers of the neck. If this is not attended to, the birds treated and the cause removed, it may result in roup. With genuine roup there is usually an odor about the head of the affected bird. Sometimes the eyes are swollen shut or the lids are stuck together. In this case a cheese-like mass sometimes forms under the lids, and if the lids are not opened and this removed and kept washed out, it will destroy the eyesight entirely. The face of the bird is sometimes swollen and a tumor forms on the side of the face between the eye and the nostrils. Roup is a very infectious disease, and all sick birds should be isolated.

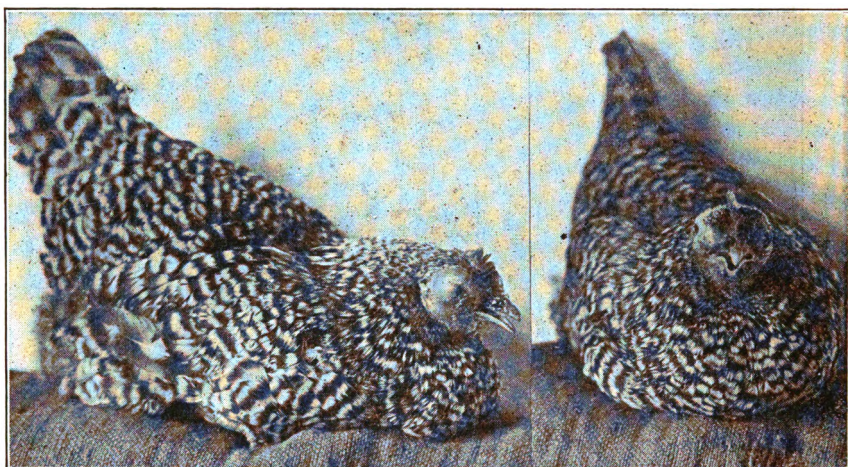


Fig. 28.

A genuine case of rump. Eyes swollen shut and a very offensive odor about the head.

TREATMENT:—When the cold or indication of rump is first noticed the bird should be treated as follows: Take the nostrils between the thumb and forefinger and press them together, gently moving the fingers toward the beak. Also press between the nostrils and eyes in an upward manner. This loosens the discharge and presses a great deal of it through the nostrils and clears the head of the bird ready for treatment. We also press the finger against the crevice in the roof of the mouth and remove all the mucous possible. We next plunge the head into a pan of warm water, to which has been added creolin or zenoleum (one teaspoonful to a pint), permanganate of potash or germozone until the water becomes a deep wine color.

We prepare the permanganate of potash by taking a pint bottle and filling it about one-fourth full of these purple crystals. We pour in enough water to nearly fill the bottle. We shake this mixture until the crystals are dissolved. When ready to treat a bird, we pour in enough of this to turn the water a rich wine color. We have found germozone, made by the Geo. H. Lee Co., of Omaha, Neb., more effective than permanganate of potash. Zenoleum is one of the best disinfectants.

The head is kept under the water for twenty or thirty seconds. By this treatment the solution is distributed through the nostrils and canals. It should be given once a day or at least every other day until the symptoms

have disappeared. Grip the legs and wings of the fowl with one hand so the pan cannot be kicked over and dip the head with the other hand.

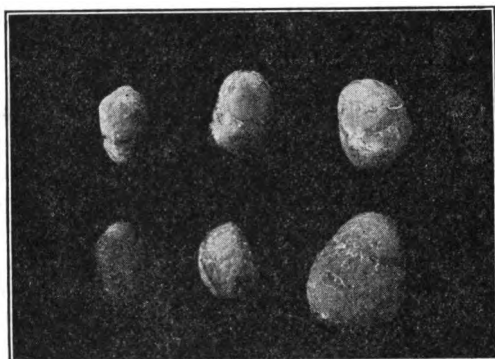


Fig. 29.

Growths of cankerous accumulations which were taken from the swollen eyes of chickens which were suffering from roup. This accumulation must be removed each day from underneath the eyelids and the eye treated by dropping into it two or three drops of undiluted zenoleum or a solution of equal parts of creolin and water. If such cases are not taken in time the bird is apt to lose the eye entirely.

SIMPLE REMEDIES FOR COLDS AND ROUP

There is a remedy that has proven very valuable and simple in many cases. After the nostrils, eyes and face have been thoroughly cleansed, use a 25 per cent solution of either argyrol or silvol (organic silver salt). After the cleansing has been done wait a few minutes before applying the oily solution. The silver salts do not coagulate albumen, they will absorb and destroy germs and bacteria. This often proves a very efficient remedy in treating diseases of the nostrils and throat. It is used in treating human beings with great success, and can also be depended upon in many cases of colds and roup in chickens.

DIPHTHERETIC ROUP

We have found that the treatment of poultry very much resembles the treatment of human beings. In cases where one patient may respond to one remedy, another patient may not be influenced by it to any noticeable degree, and for that reason we give several different remedies which we have found beneficial in various cases.

We have found some cases of roup where nothing that we have used would give any results until we have tried out the following remedy recommended to us by Dr. B. F. Kaupp, of the North Carolina Experiment Station, which we have found to be very beneficial in many instances:

"If a bird is not a valuable one, it is better to destroy it. It is well to remember that the head as well as the body be buried deeply, or better, burned.

"Thorough cleanliness and disinfection of the buildings is essential. The germs of the disease can be carried on the hands, clothing, feeding utensils or on the feet of animals.

"Always quickly isolate the sick birds. If it is desired to treat the sick bird and to obtain the best results, it will be necessary to first procure a syringe with a strong bulb so as to force the liquid through the nasal canal. An ordinary medicine dropper bulb does not give force enough. Syringe out the parts with a 20 per cent solution of common baking soda. After a few minutes this will be found to have dissolved the mucous. Next syringe out the parts with equal parts of peroxide of hydrogen and water.

This will thoroughly cleanse the parts and prepare them for the drug calculated to destroy the germs and allay the inflammation. Inject a quantity of the following:

Oil Thyme	30 minims
Oil Eucalyptus	20 minims
Menthol	10 grains
Oil Petrol	2 ounces
Mix thoroughly.	

"All liquids injected into an inflamed mucous membrane should be warm. The material can be warmed by setting the bottle containing the mixture in hot water.

"Treat the eye in the same manner as the nasal type and touch the ulcers in the mouth with a stick of nitrate of silver (lunar caustic)."

OTHER ROUP REMEDIES

We have also found it very beneficial to use the following mixture in the nostrils when the colds first appear: Undiluted zenoleum or a solution of equal parts creolin and water, or germozone as per directions.

Clean out the nostrils and head well before using the above remedy, then treat once a day or every two or three days in mild cases. It is good to bathe the head in warm water, to which has been added a little of the zenoleum, creolin, or germozone as before recommended. After the nostrils have been cleaned and the head dried, inject a little of the above mixture into the nostrils and work it well back into the head. If the bird's eye is affected remove all the mucous and canker from the eye and then put a few drops of undiluted zenoleum into the eye, or two or three drops of a solution of two parts water to one part of creolin.

COMMERCIAL REMEDIES

One of the most effective ready prepared remedies we have used is the roup remedy sold by the American Poultry Supply Company of Kansas City, Mo., also the Coldene and Pipene sold by the Licene Manufacturing Company of Chicago. They guarantee a cure of most cases.

Serums are being made for the treatment of roup in poultry along the same line that serums are made for the treatment of cholera in hogs. None have yet been perfected to a degree that we would like to recommend them, but this will eventually be the solution of the roup problem.

TAKE PREVENTIVE MEASURES

Upon the occurrence of an outbreak of roup, the first thing to do is to take steps to check it as quickly as possible. All affected birds should be removed at once from the remainder of the flock to a place that is clean, dry, well lighted, comfortable, well ventilated, and which can be thoroughly disinfected after the disease has run its course. Remove the litter from the houses and disinfect the house and runs thoroughly with zenoleum or creolin mixed according to direction, or with a 5 per cent solution of carbolic acid. We have tried out and tested practically all the serums, "guaranteed roup cures" and remedies of various kinds recommended for roup. But we have come to the conclusion that the safest and best thing for any poultry raiser to do is to use all possible means to prevent the disease. This can best be done by breeding from healthy stock, providing comfortable houses which admit an abundance of ventilation and sunshine. The houses and yards must be dry. Ventilation, without drafts, is the best preventive. By all means have an opening near the floor to take out the bad air, if it is nothing but the exits for fowls left open or covered with wire to permit of the circulation of air. So in addition to your shutter, curtain or open front also have small openings near the floor in the front of the house to complete the system of ventilation and to take off the bad air. Be sure the floor and walls of the house are dry.

FORMULA A1

Recommended by Tom Barron of England

The following mixture is a great corrective and preventive. It is one of the best things we have ever used for the correction and prevention of

roup, canker, chicken pox and other diseases. It should be used frequently in the fall before putting the birds into winter quarters and should be used throughout the breeding season.

Mix in the following proportions:

Magnesium Sulphate	10 oz.
Magnesium Oxide	1 oz.
Sulphate of Iron	2 oz.
Ground Ginger	2 oz.
Sulphur	3 oz.

Give one tablespoonful in moist mash to 12 birds each morning for three mornings and discontinue for two weeks, then repeat.

The magnesium sulphate acts on the intestines; the magnesium oxide on the kidneys; sulphate of iron acts on the blood; the ground ginger stimulates all organs, and the sulphur is a general antiseptic. This is therefore a good tonic for the fowls.

For serious ailments the dose mentioned above should be increased. Make a ball the size of the end of your finger, mix with a little mash and force down the bird's throat.

No one, however, should ever try to control a disease without first removing the cause.

We know that sulphur is one of the best antiseptics that we have. If you can't do anything more we advise you to add to each gallon of your dry mash or moistened mash, four heaping teaspoonfuls of sulphur, mix thoroughly and repeat two or three times a month during the breeding season and during the cold, damp days of fall and when the birds are first put into winter quarters.

TUMORS CAUSED BY ROUP

If the bird has a tumor on the face caused by canker and pus forming under the skin, it is best to open this with a sharp knife and let it bleed freely and work out all the contents that you can. Wash this out with the zenoleum and water or some other good disinfectant, then put some powdered alum and sulphur into the place where the incision has been made. Also place a small piece of absorbent cotton in the incision. The bird should be fed a good stimulating mash, moistened with sour milk or water. If the bird's eyes are swollen shut and it cannot see, then force a little of the feed down its throat for a few days. Dip its bill in water so that it may drink. At least see that it gets food and water until it begins to recover and is able to see to eat. If the bird is very low in vitality and thin in flesh, about the best thing you can do is to kill the bird and burn it.

The best treatment for roup and kindred diseases, is prevention. The disease can be prevented by stopping all sources of infection. Some things to keep in mind are:

"1. Do not make tender house plants of your birds at night, as they will contract cold during the day.

"2. In introducing new birds always procure them from uninfected flocks.

"3. Isolate all new birds and all birds that have been exhibited at shows for two or three weeks to make sure that they do not develop the disease.

"4. Exclude from uninfected houses and yards poultry and all other animals, including men, coming from those that are infected.

"5. Do not use implements, as hoes, shovels, etc., that have been used on infected premises.

"6. Keep the birds in a good hygienic condition, well nourished and in dry, well ventilated houses and roomy yards.

"When the disease has been introduced into the flock careful precaution may prevent its spread.

"1. Immediately separate from the flock any birds that show symptoms of the disease.

"2. Disinfect the yards and houses. A 5 per cent solution of carbolic acid may be used on the yards. Remove the litter from the houses and dis-

infect freely. This 5 per cent carbolic solution may be followed by white-wash.

"3. Use pure drinking water in clean vessels.

"4. Keep watch on the flocks, so that any new cases may be isolated at once.

"5. Burn or bury deep all birds that die."

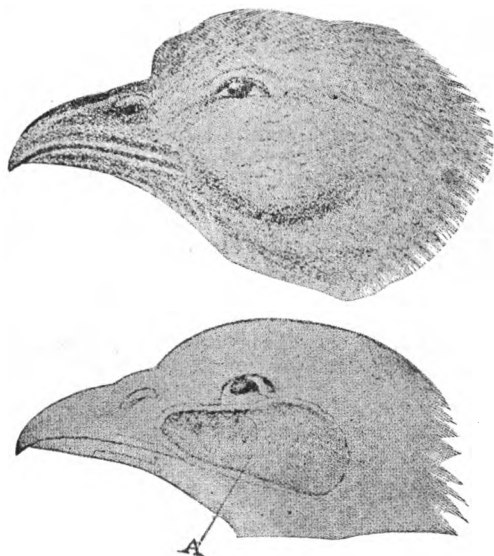


Fig. 30.

From Megnin.

The lower figure shows the maxillo-ocular sinus, which opens into the socket of the eye, and communicates with the nasal cavity. The upper figure shows the roup tumor on the head caused by the filling of this cavity with cheesy pus. If the tumor is large, we usually open it and after we have pressed out as much as possible, then fill the cavity with equal parts of powdered alum and sulphur.

If the parts affected by roup are painted with water soluble iodine, being treated once a day, will usually effect a rapid cure. Or, a famous English remedy for roup and colds is the use of a 5 per cent solution of Cargentos. The affected parts are treated with this by dropping some of the solution into the eyes, nostrils and crevice in the roof of the mouth. Some poultrymen in this country claim this gives them splendid results.

CANKER

This is a disease that is quite common among poultry in the fall, winter and early spring. We have experimented with many different remedies and also with methods of prevention. A bird that has recovered from canker and that was never seriously sick with this disease can be used as a breeder. A vaccine or serum is now being made that will cure this disease.

SYMPTOMS:—There is usually a yellowish cheesy fungus growth on the tongue, mouth or throat. There may be a rattling in the throat and the bird may have difficulty in breathing or swallowing. The bird usually has considerable fever, and just before this cheesy growth forms you will notice that it is always preceded by a thick slimy mucous in the mouth. These spots of canker are sometimes an indication of digestive disorders, or may be caused by one bird picking another in the mouth while fighting, or by the litter in which the birds scratch being moldy and damp, or is thought to be related to roup or kindred diseases.

First see that the bird is not constipated. In fact, it is a good plan to give three-fourths to a teaspoonful of epsom salts to each. This is the first thing to use in the treatment or as a preventive.

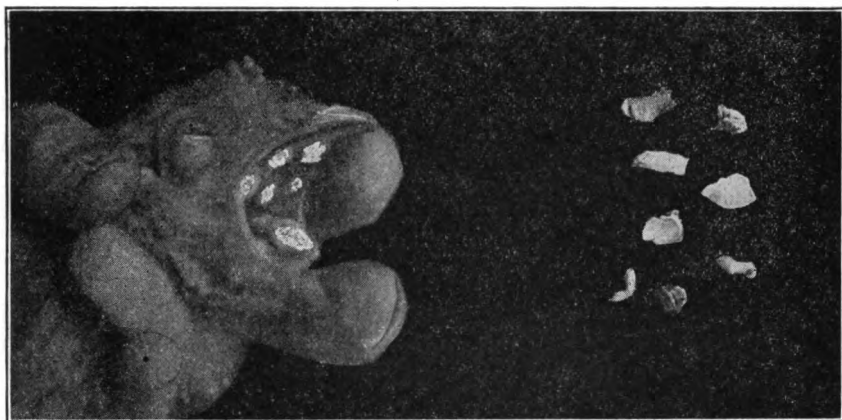


Fig. 31.

CANKER.—This shows a bad case of canker. You can see the whitish or yellow patches on the mouth or tongue and some of the particles which have been removed. These patches must be removed with a dull knife or a sharp splinter. Then treat as directed.

Control:—It pays to treat only birds that are slightly diseased or that are valuable. It is better to kill affected birds by wringing their necks. Burn all carcasses and disinfect poultry houses and ground. Use one 7.3 grain mercury bichloride tablet per gallon drinking water in a non-metal container. These are not used more than ten days at a time. Also feed in wet mash every other day as much of the following mixture as the birds will eat in ten or fifteen minutes: 1 part Epsom salts, 1 part dry powdered sulphur to 12 parts dry mash.

TREATMENT:—It is necessary that these spots of canker be removed from the tongue or mouth before you attempt to treat the disease. We remove the canker by using a clean sharp splinter or a dull knife. Before removing the spots of canker it is advisable to paint the spot with iodine and allow this to remain on for two or three minutes. Then remove the canker from the mouth, throat or tongue. The cankerous growth will often accumulate in the throat, windpipe or trachea, and prevent the bird from breathing, and it will die for that reason. In such cases it is necessary to be prompt in discovering it and in removing the canker from the trachea. If you notice a bird opening its mouth as if gasping for breath or hear it making a wheezing sound as it breathes, you had better catch the bird and examine its throat carefully for canker. Look down the trachea for these yellowish patches. If they are not removed they may grow to such size that the bird cannot breathe and death results.

Do not be alarmed if the sores bleed a little after the spots are removed. First give a good purgative. Remove the yellowish accumulations and touch the spots with powdered alum, creolin, zenoleum or iodine. Repeat that operation every second or third day if necessary. A clean feather or swab or camel's hair brush may be used for this purpose. If the canker accumulates very rapidly, it may be necessary to remove it every day.

One of the best remedies we have used for canker is the following:

Iogen (surgical dressing powder).....one part
Boracic acid.....six parts

Mix thoroughly. After the canker has been removed take a clean stick or swab and rub the mixture on the spot which is affected. If the canker is

in the trachea, or windpipe, remove the canker and apply the powder by blowing it through a goose quill, glass tube or powder blower. It can be blown down into the trachea with the blower. Be sure it reaches the affected parts. This has proven to be effective.

CANCEROUS CANKER

One of Leavenworth's prominent poultrymen conducted some experiments with poultry diseases and we quote what he had to say concerning his tests:

"Just getting over a hard fight with chicken pox and canker, and thought possibly you might be interested in the many experiments carried on at my experiment station—my basement.

"I waded through every poultry disease book I have to find some dope on chicken pox, and believe me I was simply disgusted at the treatments suggested. Most of them recommended some patent remedy, and in nearly every case they said, 'Rub some kind of dope on the sore,' and that was all. Some suggested removing the scab and painting the sore, but NONE SEEMED TO TAKE THE THEORY THAT IT IS A BLOOD DISEASE.

"Now I don't think I've discovered anything new in my treatment, but I've proved my theory that it is a BLOOD disease. Three years ago I used calcium sulphide, 2 grains a day per bird, in capsules and cured all of our birds. This year I painted the sores with creolin and used the sulphite in the mash, two grains per bird, thoroughly mixed in the mash and it worked wonders. Calcium sulphide is one of the best known blood purifiers. I got the idea from Stewart's calcium wafers, which are advertised extensively in the newspapers as a blood purifier, and figured that what was good for people would also be good for chickens. So now, I've got a real chicken pox remedy and a sure cure.

"I've had a lot of trouble with canker, and though I haven't seen anything in poultry disease books about CANCER, I am convinced chickens have such. The statement in some poultry books that colds, canker, catarrh and roup are symptoms of the same disease, I think I have proved entirely wrong, for I have had some cases of canker wherein the patient had absolutely no symptoms of a cold. In your disease book I find you are the only one of the many authorities who takes the position that canker can be caused by something other than a cold. Some of my birds had no sign of colds, yet had plenty of canker. In working with them I found that the phlegm came up from the crop and filled their throats and even went into the windpipe, almost choking the fowls. I began to doctor for sour crops, indigestion, etc., and I think I have struck it in giving, a good dose of castor oil and then dopping the water with Lee's Germozone, but I think perman-ganate would do just as well.

"Some cases of canker I painted with iodine; others with tincture of iron, creolin, etc., and even used the nitrate of silver. The last named proved the most effective, but one has to be careful not to get it too strong.

"However, I've found some real CANCER; a fibroid cancerous growth that, instead of building up, eats into the flesh. Have one hen and a cockerel that have it, and it has been the toughest proposition I ever tackled. Think I have it beaten in the cockerel, for it was so far cured that I sent the bird to Kansas City this week and got third with him. It came in a corner of the mouth and ate down into the flesh and back toward the eye. I used tincture of iron on it, but each day had to dig out the cancer with an orangewood stick sharpened on one end like a chisel and the other drawn to a point that I used to trace down the small fibrous strands like threads.

"The case of the hen is the most interesting I've ever tackled. I've been working on her, most of the time on the theory that it was only a canker, but a few weeks ago I got a hunch that I was wrong, so took a new shoot on the treatment. The sore started out like a canker and each day, even though I picked it off, I found it eating deeper into the throat. It is just at the base of the tongue and only a little distance removed from the opening to the windpipe. It is a hard place to get at, but by using an electric light close up and the orangewood stick I've been able to dig it out each day. It is now a hole about a quarter of an inch deep and as big as a dime.

"I had one pullet that had a canker which *turned into a cancer*, for while it at first was easy to remove, it later began to eat into the tongue. She had lost over one-half of her tongue, or a side of it, when I got the silver nitrate hunch and it stopped the cancer right then and there. But she had been doped so much and so thrown out of condition that she went into a molt, though she had never laid an egg.

CAN BREED LATE MOLTERS

"Interested in some more things I think I've found out for sure. One is that one can breed late molters. I had three very light birds—grand dam, dam and daughter—all same type and color, great on undercolor and the grand dam the lady who won sixth pullet in Chicago. They laid fine up to about December 1st, didn't shed a feather up to that time. One morning I went into the chicken house and found several hatfuls of feathers. Looked around and all three of those birds were as bare as my hand; the saddest looking affairs I ever saw, for it was during that awfully cold spell. I hustled them into the house and began to feed them heavily and now all of them are back in the chicken house, with a pretty fair supply of feathers, and one of them is laying, though she has plenty of feathers still to grow. I learned one other thing—that a molting hen craves green stuff; cannot get enough of it—in fact they wanted nothing but sprouted oats and lettuce, so I figured they wanted the iron more than anything else."

PIP

A mucous or discharge from the mouth sometimes collects and dries on the tip of the tongue. The skin becomes hardened or a scab forms and sometimes cracks partially away from the tongue leaving a raw surface.

The first thing to do is to treat the cause, which is usually the result of colds or catarrh. It is best to keep the scab moistened with a mixture of equal parts of glycerine and water. After the scab comes off the surface should be treated with a disinfecting solution of some sort and then with glycerine. You should not confuse this trouble with the more serious disease known as canker.

TUBERCULOSIS

The most common method of spreading this disease is through the transfer of infected fowls from flock to flock. It is said that it can be transmitted through eggs. The most common source of infection is through the droppings of infected birds. As is explained later, when a post-mortem is made the liver will often appear spotted, being studded with creamy-white or yellowish white tubercles. The spleen is usually enlarged and often

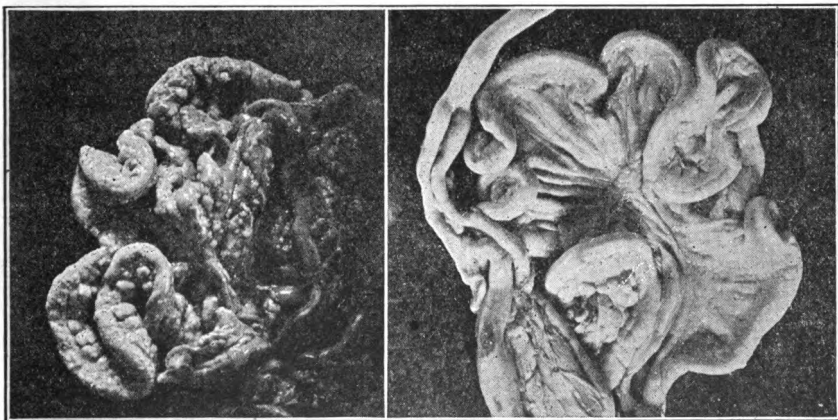


Fig. 32.

On the left is the intestine from a chicken affected with tuberculosis. You can easily see the little white nodules covering the intestine. On the right is the intestine from a healthy fowl.

covered with the tubercular nodules. The intestines are often infected the same way. The lungs and other organs may show signs of infection, but not so often visible to the naked eye as in the case of the above organs. The bones are often affected, especially around the knee joint and birds thus affected generally show signs of lameness.

This disease is becoming more common. We recently visited a large poultry farm in the East in company with three men from a Canadian Experiment Station. We found a number of adult fowls sick, and asked for permission to examine one that was near the point of death. We found the bird was dying as a result of this dreaded disease. The poultry farm was selling baby chicks by the thousands from this stock and shipping them to all parts of the United States and Canada. What may we expect of the future if diseases are scattered promiscuously?

These minute germs gain entrance to the body and there multiply by the thousands, causing small tubercles or nodules to form, as in the accompanying illustration. It is difficult to recognize the disease in its first stages. As time advances the bird grows thinner, the comb and wattles grow pale, and the bird shows general weakness. In the more advanced stages the feathers are ruffled, the bird becomes lame and often has diarrhea. Because of the lameness, caused by tuberculosis of the joints, many poultrymen call it rheumatism. The birds often have bright eyes and a good appetite. Dr. Morse says: "At the post-mortem examination you may have your suspicions strengthened by finding liver, spleen, intestines and membrane uniting the intestinal folds (mesenterics) studded with yellowish white cheesy nodules of various sizes."

METHODS OF CONTAGION.—(From Poultry Diseases and Their Treatment, Maine Experiment Station). The spread of tuberculosis from fowl to fowl takes place when the living bacteria are transferred from the diseased to the healthy birds. From the fact that tuberculosis lesions are most

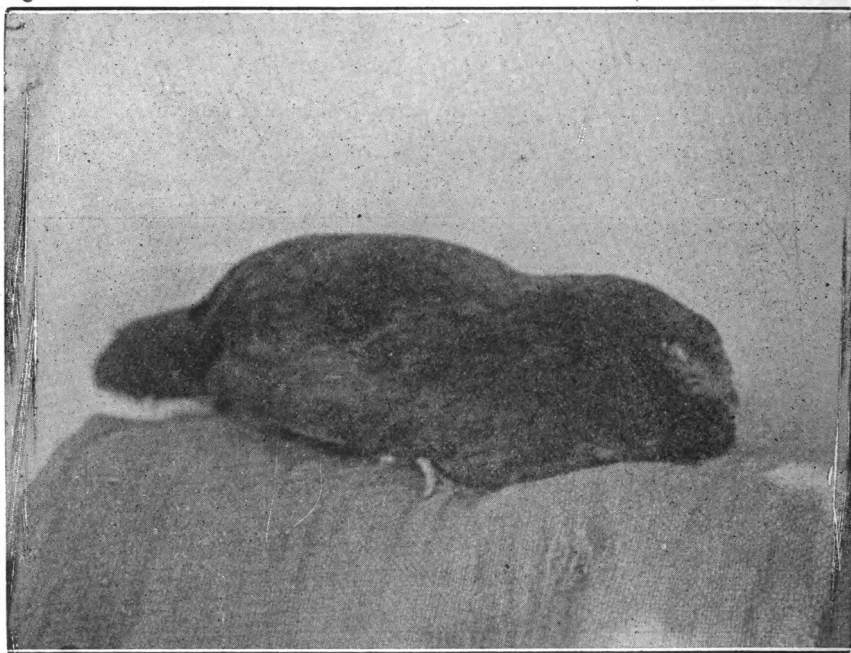


Fig. 33.

A case of tuberculosis in the last stages. The hen was practically nothing but skin, bones and feathers.

commonly found in the internal organs of the digestive system we may conclude that the bacteria usually enter the body along with the food. Examinations of the tubercles situated along the intestine shows that in many cases these communicate directly with the interior of the digestive tract. These are constantly emptying enormous numbers of bacteria, which are carried to the outside by the feces of the bird. Without doubt the droppings of tubercular fowls are the most important factor in the spreading of this disease. This is especially true when in addition the birds are fed on ground which is partly covered with these droppings. Besides, the infectious material may be very easily carried by the feet and thus mixed with the food.

CONTROL:—Tuberculosis can be eliminated only by disposing of the infected stock. Treatment is impractical and of no value in the control of the disease. To eradicate the disease:

1. Replace the entire flock as soon as possible with healthy birds raised on uninfected ground.
2. Kill and burn all birds showing symptoms of tuberculosis.
3. Put dropping boards in poultry houses and keep them clean.
4. Get plenty of fresh air and light into the poultry house.
5. Get rid of old fowls.
6. Burn and bury deep all dead birds.
7. Plow up and sow down land when practical.

TREATMENT.—No cure is known for the disease at present. Remove all sick birds. Disinfect the houses and everything used in connection with the poultry yards. If many birds are affected we advise selling the flock and buying from a flock which is known to be free from tuberculosis.

Extreme care should be taken that the ground around the chicken house and the house itself are absolutely disinfected. Cultivation and a growing crop will aid materially in getting rid of the disease in the ground. As a precaution, bichloride of mercury can be used in the drinking water, in the proportion of one 7.2 grain tablet to each gallon of water. Use cement, earthen or wooden vessels as bichloride of mercury readily attacks metal.

Prof. S. F. Edwards, in the Journal of the American Association of Instructors and Investigators of Poultry Husbandry, has this to say concerning the control of tuberculosis among fowls:

"There is little or no satisfaction in attempting to treat individual cases, and the use of drugs is a waste of time, patience and money. When once the disease gains a foothold in the flock, it is difficult to eradicate except by the adoption of drastic measures. The quickest and most effective method is to kill off all the birds, disinfect the premises as thoroughly as possible, and start with new stock from a flock that is known to be free from disease. In small flocks this method would seem advisable. The fowls could be examined, and all that were found to be free from the disease could be sold, thus lessening the loss. In large flocks or where it is desired to preserve a certain strain in breeding, a modified Bang system may be carried out based on the same principles as employed in eradicating tuberculosis from a herd of cattle. All birds that show the least signs of illness should be promptly slaughtered and cremated. The well birds should be removed to a new ground, and new houses built; or, if the houses already in use are of sanitary construction they may be thoroughly disinfected and white-washed, after which they may be moved to the new ground and used with safety.

"Eggs for hatching should be secured from stock that is known to be healthy. If incubators are used the problem is simple. Keep the chicks entirely separate from the old fowls and on clean ground only, and as they grow up dispose of the old flock to the best advantage possible, thoroughly disinfecting the houses and runs used by the old flock. If hens are depended on for hatching, the chicks should be taken away to artificial brooders as soon as hatched and raised as already suggested, entirely separate from the old flock. Precautions should also be taken to prevent the possible infection of the fowls from bovine sources by the feeding of offal from slaughtered tubercular cattle or hogs, or from human sources by picking up sputum carelessly expectorated onto the ground by consumptive persons.

"Care should be taken also in buying new stock, to secure birds only from flocks that are known to be free from disease. An additional preventive is to increase and maintain the natural vigor of the fowls by care in breeding and feeding, and housing in open air houses."

CROP BOUND

SYMPTOMS.—The crop is hard and greatly distended. Sometimes a bad smelling liquid runs from mouth and nostrils. The bird's feathers often appear ruffled and the comb is pale.

TREATMENT.—These cases often can be cured without an operation by getting the bird to swallow sweet oil and castor oil. Beginning at the top, work the contents of the crop and knead it until you have loosened a part of the contents. Give more oil and continue to knead until the contents are all loosened. Then hold the bird with head down and try to work some of the mass off through the mouth. If you are unsuccessful in this an operation may be necessary.

The following methods for this operation are given by Sanborn (Farm Poultry Doctor): "If someone can hold the bird for you it will make the operation easier. Pluck out a few feathers and then cut through the skin over the crop a line about one inch long. This cut should be in the middle in line of the body. Then make an incision three-fourths of an inch long through the crop. The distension of the crop will cause the opening to gap, and the mass will be in plain sight. With toothpicks, blunt pointed scissors, tweezers or similar tools, take out the contents of the crop. This done, run the finger into the crop and make sure that there is nothing remaining to obstruct the outlet to the organ. When sure all is right, take three or four stitches in the opening in the crop, making each stitch by itself and tying a knot that will not slip. Then do the same thing to the cut in the skin. For stitches use white silk, or if nothing better can be obtained, cotton thread, No. 60. Keep the bird by itself for a week, feeding soft food.

"The above operation is not a difficult one and is usually successful. Care should be exercised to have the hands and instruments thoroughly clean. After the contents of the crop have been removed the wound and the empty crop itself should be thoroughly washed out with warm water (108 degrees to 110 degrees Fahrenheit). The edges of the skin wound should be well greased with vaseline. It is well to feed the bird only milk for the first day or two."

If you have many cases of crop bound try to discover and remove the cause. If you have dirt floors in your poultry house and these are covered with litter, you may have trouble with crop bound. If you feed sprouted oats or other green feed, or moistened mash and throw these in the litter on the floor, you will have many cases of crop bound. Many hens thus affected in your flock indicate that there is something seriously wrong with your methods.

INFLAMMATION OF THE CROP

Inflammation of the crop is frequently caused by the bird eating something which affects the inner lining of the crop, such as mashes which are too hot, unslaked lime, paint peeling, rat poison or grain husks.

This inflammation causes the bird to have abnormal thirst for water, so that one of its first symptoms is its thirst, the crop being filled with water and gas, together with small quantities of food.

The crop is distended but soft. The bird is indisposed to move and frequently shows a sign of vomit.

If the bird is turned head down the liquid passes out at its mouth. The liquid has an offensive odor which is caused by fermentation. The first step in the treatment of the disease is to empty the crop, which is done by turning the head downward and pressing on and kneading the crop. Give the bird some warm water by pouring it down its throat, then knead the crop and repeat the above operations. This removes the foul contents. Give a teaspoonful of castor oil as a purgative, and one-fourth teaspoonful of common baking soda in a teaspoonful of water to correct the acidity.

Charcoal also has a tendency to correct the acidity and should be kept before the birds at all times. Bismuth tablets, two or three grains, about three times a day may be used to advantage.

WIND PUFFS AND INFLATED CROPS

Occasionally birds, both old and young, will be found with wind puffs which have accumulated beneath the skin, and cause the body of the bird to have a very much enlarged appearance. This is quite common in young cockerels that have been caponized. In such birds we take the point of a sharp penknife and puncture the skin and allow the air or gases to escape. If the birds are properly fed and cared for, in a few days the trouble will disappear. In some cases this trouble can be brought on by improper feeding which results in indigestion and accumulation of gases.

Where the crop is greatly inflated it is sometimes caused by birds eating decayed food or foods that have become soured and impure. This condition is due to the pressure of gas forming bacteria. You should first remove the cause and then give a mild antiseptic in the drinking water, such as 1 to 1,000 bichloride of mercury or 1 to 500 carbolic acid.

THE LIVER AND HEART IN HEALTH AND DISEASE

The liver and heart are the two organs very closely related to health and disease and are linked together by the circulatory system. In order to get their relation, let us trace the circulation of the blood. For the heart there are practically two circulatory systems, one to the lungs, where the blood receives its oxygen and gives off carbon dioxide, the other to the body cells and digestive tract, where the blood carries the oxygen and food supply, takes off carbon dioxide and waste material from the cells, and from the intestines takes up food material and moisture.

Beginning at the left ventricle, the blood is forced into the aorta, or large blood vessel. This branches into smaller blood vessels in various parts of the body, first to the heart itself, then to the lungs, and then divides into branches for the anterior and posterior parts of the body.

The arteries finally divide into very small vessels, called capillaries, and it is while the blood is passing through these capillaries that the oxygen and food material is given off to the cells. The oxygen is used to oxidize the food, to produce heat energy and carbon dioxide is produced. The carbonic acid gas, with other waste materials, passes from the cells back into the blood. It is also in the capillaries that the color of the blood is changed from red to blue. This change of color is due to the blood cells giving up oxygen and taking carbon dioxide.

The blood then passes into capillary veins and these empty into larger veins, and finally the blood from the posterior and lower part of the body empties into the lower or posterior vena cava, except the blood from the abnormal organs or the intestines. The latter enters the portal vein. The latter blood is laden with food material and passes through the channels of the liver. Here the bile is abstracted and the liver takes up a great deal of fat and sugars, in the form of starches, to be stored for future use. After the blood from the portal vein passes through the liver it also passes into the inferior vena cava, then to the right auricle.

The blood from the anterior part of the body and head passes through the superior vena cava and also enters the right auricle, then it passes into the right ventricle. From the right ventricle the blood is forced through the lungs. Here the blood corpuscles exchange carbon dioxide for oxygen through the membranous lining of the air cells of the lungs. Impurities are given off here, from the blood serum, in the form of moisture. The temperature of the blood and the body is also controlled to a great extent through the lungs and air cells. This process acts in a manner similar to the sweat glands in the human skin, where moisture evaporates from the surface of the skin and cools the body.

From the lungs the blood passes back to the left auricle through the pulmonary veins and then to the left ventricle, which completes the circle.

The blood is forced to the various parts of the body and lungs by the contraction of the heart muscles, but is forced back through the veins by contraction of the body muscles and movements of the various organs and by gravity. Any interference with the blood circulation through the lungs or liver or intestines soon affects the heart's action. When the lungs become inflamed, as in pneumonia and bronchitis, the blood cannot pass through the vessels. The right ventricle dilates first, then the right auricle

and finally the vena cava. There soon becomes a lack of oxygen in the blood, and the condition is noted by the head and comb and skin turning dark in color. This same condition may result from inflammation of the intestines, or by distention of the body with fluids or gas, resulting from peritonitis or by enlargement of the liver. The tendency is to press on the air sacs and lungs and thus inhibit or check the circulation.

When the blood cannot pass through the lungs and right heart the latter becomes dilated and the veins all become distended. This distention is mostly noted in the liver and then the intestines. It is very often the cause of sudden death of fowls. The auricle or the large vein leading into it may rupture, and the heart may be paralyzed, or, as is often the case in fatty liver, there is a rupture in the latter organ.

By the study of the circulation we learn some of the causes of liver diseases. In a way the liver may be said to be a filter for the blood. As stated before, all the blood from the intestines passes through the liver on its way to the heart and the first process of assimilation of food and excretion takes place here. Starches are taken up by the liver cells and converted into sugar. When the body cells need it for food, it is given back to the blood to be carried to tissue cells again. This process of storing fat and sugars may be excessive, especially when highly concentrated starchy and fatty foods are fed. In other words, the hen may not exercise enough or produce eggs enough to use up the food products, and then fat takes the place of liver cells. We then get what is called a fatty liver. In the heart, fat takes the place of muscle cells and even the pericardial sac may be filled with fatty tissues. This formation weakens the organs, as is seen in fatty liver. It is soft and breaks easily. The enlargement also leads to the stoppage of circulation and then by sudden exercise the heart or liver may rupture.

The contracted liver is the result of the fatty liver. While the fat is being deposited in the liver, a great many of the liver cells are destroyed and gradually the liver is not able to do its work. By change of feed, or lack of feed, and by the fowl taking more exercise or beginning to lay eggs, the fat stored in the body and liver is used up. The liver shrinks into a small organ because the liver cells were destroyed by the fat and are not again formed.

In infectious or in inflammatory disease of all kinds, more especially diseases of the intestinal tract, the liver is usually affected more or less. The liver is a filter, and as disease germs circulate in the blood there is no better place for them to lodge than in the liver. This is the reason we find the red inflamed spots or white particles in the liver when other parts of the body are diseased. We have many poultrymen report that their birds are dying with liver trouble. They examine the dead bird and find the liver discolored and not otherwise normal in appearance and their first conclusion is that death was caused by liver trouble of some sort. We remember one case where dozens of hens had been lost and in each case they reported liver trouble as the cause. We examined some of these dead birds and found death resulted, in each case, because of ovarian trouble. The impurities from the ovary had been taken up by the blood and nature, in trying to correct the trouble, had lodged many of the impurities in the liver. This caused a slightly enlarged liver with many discolorations. You will find this same condition of the liver resulting from many other diseases. In its effort to correct such conditions, the liver is usually more or less thus affected.

In white diarrhea the germs are isolated from the liver in pure cultures, and it may be the place of isolating other disease germs.

Again, the liver is in close contact with many other organs, with only a thin membrane to separate them, as the intestines, lungs, heart and air sacs. When the surface of the liver becomes inflamed or one of the organs becomes diseased, the disease extends through the membranes, and that is the reason we so often find more than one organ affected at the same time. We find cheesy deposits or pus in the air sac when the liver is affected, or the surface of the liver becomes affected when the lungs are inflamed. There are conditions anyone can observe by making careful dissections of the chickens that die in their own flocks.

LIVER DISEASES

SYMPTOMS.—Congestion and inflammation of the liver are usually caused by too heavy feeding of a ration which is too rich in starch elements. Feeding too much corn, blood meal, or so-called egg foods, especially to birds which are housed and yarded in small lots, will irritate both liver and egg organs. The first sign of the trouble is a watery diarrhea, dark at first, but changing in a few days to a yellowish color. The feathers are rough and dull and are inclined to stand out on the birds. At first there may be a lack of color in comb and wattles, but they usually change to a dark red or purple, and sometimes the trouble is caused by overfat. In a word, the birds may die on the nest or be found dead under the roost.

TREATMENT.—Stop feeding all heavy, starchy, fattening foods and feed lightly for several days, supplying the fowls with a good deal of cut clover, alfalfa or green food. As soon as any appearance of the trouble is noticed, give each sick bird a tablespoonful of castor oil. Be sure that your birds get plenty of exercise by providing scratching material. Give your birds a dose of epsom salts in their mash food or drinking water at least

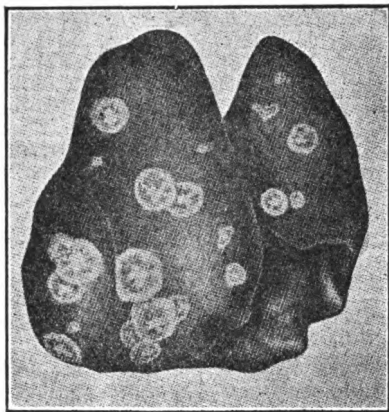


Fig. 34.

Illustration of a diseased liver.

once each month. In case of a serious attack, after a good dose of castor oil has been given to the sick birds, follow with one-fourth teaspoonful of tincture of nux vomica to every pint of drinking water.

SIMPLE DIARRHEA

The ordinary case of diarrhea is usually caused by one of the following reasons: Lice and mites, uncleanness, dampness, crowding, lack of shade, foul water, overdoses of pepper and condition powders, too much meat or ground bone, tainted meat, exposure, climatic changes, over-eating or sloppy food.

When cases are first noticed take all feed from the birds for several hours, allowing only pure fresh water. The only treatment necessary in most cases is to discover the cause and remove it. The birds should be fed lightly for a time and a little powdered charcoal mixed in their food. If the birds are valuable and demand individual attention, give each one-third to one teaspoonful of castor oil, or a tablespoonful of olive oil, or one-half teaspoonful of Epsom salts at the beginning. Begin feeding with boiled milk or curd, to which is added a liberal supply of powdered charcoal. If you haven't the milk, well cooked oatmeal or rice will answer. To this add the charcoal. Feed about three times a day and return to the regular ration gradually. Disinfect the houses and runs where such birds have been kept.

ENTERITIS DYSENTERY

SYMPTOMS.—This is a more severe form of diarrhea than the above. This is sometimes accompanied by mucus and bloody discharges. The comb is at first pale and limp and then later becomes dark and purplish. The bird is sleepy and does not care to exercise. The crop may be full of food or may contain only a little slimy fluid. If the bird has been sick for some time, upon examination the liver will be found to be shrunken. The intestines are full of mucous and are enlarged. This may be caused by foul water, or by decaying meat or food. Intestinal parasites may cause the disease.

TREATMENT.—If possible, determine the cause of the trouble and remove the same. Change the sick birds to other quarters. Clean and disinfect. Do not feed too heavily. Reduce the amount of bran and add more middlings and mix a good supply of powdered charcoal in the dry mash. For each bird dissolve one tablespoonful of Epsom salts in water and mix the mash with this. Potassium permanganate should be used in the drinking water. Treat much the same as is recommended for simple diarrhea.

A PREVENTION FOR DIARRHEA IN CHICKS

When removing chicks from incubators use the utmost care that they do not get chilled. As each chick is placed in the brooder, dip its beak into warm, carbolated water. See that it has at least one good swallow of water, containing five (5) drops of refined carbolic acid to each one pint of drinking water. Water of this strength should be left before them with drinking water to which has been added three (3) drops of refined carbolic acid to each pint of water.

It is better to use a regular medicine dropper when placing the carbolic acid in the water. An abundance of fresh air must be permitted in the brooder room and about the actual hover; care must be taken that the chicks are not chilled and just as much care that they are not overheated. Get them on the ground as soon as possible, but always have it so that they can get back to their hover, which should be kept around 95 to 100 degrees the first ten days or two weeks. In the very beginning cull out any which show a tendency toward a bad case of bowel trouble. However, unless the stock is badly infected very little trouble should be experienced if the above treatment is used.

If the chicks are properly bred, incubated, brooded and fed, not much trouble will be experienced with any kind of diarrhea.

INFORMATION CONCERNING DIARRHEA

"White diarrhea itself may be brought about by any of a number of causes—improper incubation, faulty methods of handling and caring for the chicks after hatching, etc.; but the worst form of the mischievous disease is that caused by the bacteria *B. Pullorum*. With the fact that loss of, say, one-half or two-thirds of a season's hatch attributable to the ravages of this disease, let us ascertain the cause. It is found in the presence of these germs in the old hen or breeding stock—always in fairly large numbers within the body of the infected hen in the undeveloped egg or ova.

"Tracing the life cycle or growth of these germs for a few years, starting with the hen that is being utilized for breeding purposes and with one that we know to be suffering with the disease (infected), by the trapnest method we ascertain that the hen is not a good layer, the disease preventing the fowl laying many eggs.

"By analyzing the eggs of an infected hen, we find in some of them germs of white diarrhea (*B. Pullorum*). Other than by bacterial examination, there is no way to ascertain which of the eggs contain the germs, and which of them do not; the germ eggs and the good eggs look exactly alike, and have the same outward appearance.

"We set the eggs of the diseased or infected hen. It is only natural that some of the eggs contain the bacteria, hidden in the yolk. The eggs hatch and the chicks appear normal in all respects. The chicks, however, hatching from the germ eggs, still retain the bacteria in their bodies, in the yolk from which they pass into the blood and some are given off in the excreta. In a short time the appearance of the chicks becomes abnormal. They apparently suffer from chills, for they huddle under the brooder next to the

heating system. Their heads are drawn in, and around the vent the excreta collects, forming a hard mass, generally spoken of as "pasted up" behind. These masses of excreta containing the bacilli germs are objects to which the healthy chicks pay strict attention, losing no time in picking at them and thereby becoming infected. In this manner the germs are contracted and passed from one little chick to the other.

"It is evident, then, that even one of these debilitated chicks may cause considerable loss. When there are several, as there are likely to be, the loss of the erstwhile healthy chicks naturally is heavier. It must be remembered that not all the chicks which have the germs through the accident of birth, or that pick them up as described, die. About 25 per cent do not die, and for that reason the germs continue to live their lives of mischief. While cases are on record in which all the chicks in a hatch have been lost, and that seldom is the loss less than 30 per cent, those that do not die carry the germs in their bodies, lodged in the ova undeveloped eggs; and to these birds the term "bacillus carriers" may be applied. When grown these chicks lay eggs, some of which are germ laden and hence the disease is transmitted from one generation to the next.

"The source of trouble and loss, so far as white diarrhea, the bacillary form, is concerned, having been traced to the infected hen that lays the infected egg, the best method of procedure is to kill the hen and dress it for market—a simple means of eradication, to which no objection can be made, seeing that fowls so infected are fully as good for the table as the non-infected, as the disease is one that confines its ravages to poultry alone. To man it is harmless.

"It would be neither wise nor just to the poultry industry to go into the chicken yard with an axe and slay indiscriminately; in so doing, the good layers would be killed with the bad, causing loss of time and profit. A weeding out process must be adopted—a process by no means simple and not understood by the average poultryman. The differentiation of the bad from the good is done by testing the blood of the fowl. Small quantities of blood are taken from the wing veins of individual birds and this blood is submitted to tests. On account of the nature of the work, this must be done in the laboratory. The process is known as the Agglutination test. Blood from the individual fowl having been tested by this method and found to be positive, the supposition is that the bird from which the blood has been taken is a bacillus carrier—the germs are within its body—and the bird should be eliminated from the flock. The killing of just one of these bacillus carriers spells true economy, when the sober fact is remembered that from the infected eggs the hen might lay, losses multiply.

"For white diarrhea, bacillary form, in young chicks, there seems to be no absolute cure so far as is known. Several remedies have been recommended, but cases of guaranteed cures have not been reported. Care should be taken to isolate the sickly looking chickens from the healthier ones upon hatching, thus eliminating the possibility of infection. It is of great importance, too, that while the chicks are in the incubator they do not pick the excreta of one another. This may be prevented by covering the incubator with dark cloth or other material until such time as the chicks are ready to be removed to the brooder. The use of sour milk for the feeding of chicks has been found to be very beneficial. When infection has once set in and the losses amount to large numbers, it is practically useless to try to raise chicks unless all the brooders, incubators and all other things pertaining to the welfare of young chicks are thoroughly cleansed before using. This is done by boiling out with soap suds or by the application of a good disinfectant. Chloride of lime dissolved in water and then sprayed over the material to be used, brooders, etc., is very effective in this respect.

GOOD PREVENTIVE FOR WHITE DIARRHEA

In many instances the following remedy has been helpful in preventing white diarrhea:

Zinc Sulphocarbolate	15 grains
Calcium Sulphocarbolate	7½ grains
Citric Acid	3 grains
Sodium Sulphocarbolate	7½ grains
Bichloride of Mercury	7 grains

This quantity should be placed in 1 gallon of drinking water and kept before the chicks constantly until they are about three weeks of age. They should have access to no other water. This prescription can be filled at any drug store in powder form. Better have several of the powders prepared at a time so that you will have enough to give the remedy a thorough trial. This is one of the best preventives for bowel trouble and diarrhea that we have ever used.

"In conclusion, we assert that white diarrhea, bacillary form, may be eliminated from the flock, although there seems to be no cure. If many of the young chicks die and there are evidences of pasting up of the abdomen, general weakness and stunted appearance, the chances are that some of the chicks have suffered from the bacillary form of white diarrhea.

"If it is possible for you to do so, obtain your eggs for hatching purposes from someone whom you know has stock that is free from white diarrhea. If you hatch out eggs from white diarrhea hens, then you cannot expect to raise the little chicks. This terrible disease is transmitted directly from parent to offspring. Either have your hens tested or set healthy eggs, and in this way only will you have success."

WHITE DIARRHEA

The subject, "White Diarrhea in Little Chicks," has been fully discussed in the lesson on 'Baby Chicks.' Students who wish to study this subject are requested to refer to the above lesson.

TURKEYS SPREAD GAPES

Bulletin No. 939, recently issued by the United States Department of Agriculture, shows that adult turkeys are important carriers of gape worms and indicate that allowing turkeys and chickens to range together is often responsible for serious outbreaks of gapes among the baby chicks. In examining a large number of adult turkeys on the Washington market it was found that 22 per cent of these birds were infected with gape worms, while practically no worms were found in adult chickens. The bulletin reports that investigations on a number of Maryland farms show that gapes always are worse among chicks, where turkeys and chickens are kept together. It has been pretty definitely established that chickens harbor the blackhead germ which takes such heavy toll among growing turkeys, and if the turkey in turn harbors the gape worm, which is so harmful to growing chicks, the arguments are certainly strongly in favor of keeping the turkeys and chickens on different plots of ground. Unless the range can be divided so that the turkeys and chickens will not come in close contact, it probably is advisable to decide to specialize on one or the other instead of trying to raise both.

THE CONTROL OF COCCIDIOSIS IN YOUNG CHICKS

We feel that the most severe losses that poultrymen have experienced during the past few years in chicks from four weeks to ten weeks of age, has been caused by a disease known as Coccidiosis.

This disease has been quite prevalent in a good many states and considerable work has been done in the state of Pennsylvania along practical lines for the control of the disease. Prof. T. B. Charles of the Pennsylvania State College, has this to say concerning his experience with the disease, and we quote him for the reason we feel that it will be of benefit to our students in controlling outbreaks of this disease among their chicks. We would recommend that you read carefully what he has to say and if any of our students should want us to examine birds which they feel are infected with the disease, we would be glad to make a post-mortem of all such specimens and report our findings. Prof. Charles says:

"Transmission of the Disease.—It affects chicks most commonly from the age of four to ten weeks, but may affect chicks much younger. The coccidium when present in the digestive tract of the chick, develops rapidly in the cells of the intestinal mucosa; this gives rise to a large number of both sexual and asexual forms which are voided in the droppings, which then become the means of general infection of the flock.

"Effect on Chicks.—The chicks affected show signs of an interruption of the normal functioning of their digestive tract. They show the following

general symptoms: Disordered feathers, droopy wings, bunched appearance, general weakness. The droppings become semi-fluid and usually whitish in color, or fluid with a brownish tinge. *In Acute Cases the Droppings Become Bloody.*

"Examination of the Digestive Organs.—The lesions are confined principally to the intestinal tract. The caeca are usually distended, and are filled with a bloody semi-fluid mass. This, however, does not always hold true; the material may also be hard or cheesy. Upon microscopical examination may be seen blood cells, cells of the mucosa, fecal matter, and numerous coccidial forms, especially the oocysts or resistant stage.

"My personal experience in controlling this disease: In 1917 the first occurrence was on a farm where poultry had not been kept for ten years. Affected chicks eight weeks old were shipped to Dr. Pickens at Ithaca, N. Y., who diagnosed it as coccidiosis and said that the germ would live in the soil for four or five years. He stated that isolation of the affected chicks and sanitation were the only possible means of control, and that in general, treatment was unsatisfactory and unsuccessful.

"Following out this program I disinfected the houses daily, limed the yards, isolated the worst infected chicks, 'and on a hunch of my own' cut out all grain from the ration and fed only a moist, crumbly mash to which I added a medicinal poultry food. This secured fair results, but the mortality in one flock of chicks reached 50 per cent.

"The same season and shortly after another flock became infected and under similar treatment the mortality reached 25 per cent. The following year the disease again occurred in a flock of 300 chicks and the mortality was 10 per cent. The next season there was not a recurrence of the disease, probably due to thorough sanitation.

"Treatment of the Disease.—We recommend the following treatment: If possible move the houses to new ground immediately. If this is not practicable, thoroughly lime the ground and also the brooder house. *Lime* is most effective and efficient for thorough sanitation; its abundant use both in the yards and in the brooder house will limit infection of chicks. It will be necessary to clean the house thoroughly. This may be done by using a good coal-tar product such as Zenoleum or Carbolineum or a ten per cent solution of crude carbolic acid. The litter should be changed daily and I believe it is advisable to burn all litter. The coccidium which causes this disease lives in the ground for several years (according to Dr. Pickens formerly of Cornell) and the control of the disease is one of absolute sanitation. It involves an enormous amount of work, but if handled carefully and thoroughly most of the chicks can be saved.

"Treatment of Chicks.—Remove at once all scratch grain from the chicks and give them a moist crumbly mash including Epsom salts at the rate of one-quarter pound to every one hundred chicks. *The epsom salts are to be used simply for one feeding*, but this treatment may be repeated weekly until the chicks are thoroughly out of danger. A good wet mash for chicks of that age may be made up as follows: 2 lbs. wheat bran; 1 lb. wheat middlings; 1 lb. corn meal; $\frac{1}{2}$ lb. beef scrap. If milk is available, the beef scrap may be omitted from this mash and the mash itself mixed up with sour milk so that it is in a crumbly condition when fed to the chicks. Feed the chicks three times a day about what they will clean up in ten to fifteen minutes each feeding. Both water and sour milk or buttermilk should be available at all times.

"Thoroughly disinfect and clean all mash hoppers, drinking fountains and other appliances at least once daily as the droppings of the affected chicks contain thousands of coccidia and the feed troughs become very easily contaminated. It pays to use a disinfectant in the drinking water. I have used refined carbolic acid—about 1:100 solution. Hydrochloric acid is probably more effective.

"Separate and isolate all chicks that are seriously affected with the disease and treat them separately. Burn all dead chicks. After ten days to two weeks, when the chicks have 'gotten back on their feet,' it will be possible to gradually work them back to the regular grain and mash mixtures which you have been feeding. Our experience has been that chicks affected with coccidiosis seem unable to digest grain.

CONCLUSIONS

"1. Careful and thorough sanitation of the poultry houses and yards is one of the most effective ways of preventing trouble from coccidiosis.

"2. In the writer's experience, sour milk or buttermilk fed in unlimited quantities will not prevent occurrence of the disease.

"3. Affected chicks are not able to digest grain but are able to digest a moist crumbly mash, preferably one wet with sour milk or buttermilk.

"4. Affected chicks (isolated for the purpose) have in every case been killed by keeping them on a grain diet.

"5. The feeding of unlimited quantities of dry mash to young chicks is favorable for the development of trouble with coccidiosis.

"The treatment outlined above has worked effectively throughout this state (Pennsylvania). The following extracts from letters demonstrate how it has worked under practical farm conditions."

Buttermilk has proven to be very effective in the control of the disease. Give all the buttermilk you can get the chicks to drink.

Another very successful treatment as is quoted by a noted authority who says to put three grains of copperas (sulphate of iron) to a quart of drinking water, or use 15 grains of catechu to a gallon of the water given the birds to drink. In connection with this a good purgative should be given.

We have always strongly urged the use of a moist mash for chicks, fed at least once a day in addition to the dry mash, grain and green feed. The above is but another evidence that we are right in this recommendation. It helps prevent many chick troubles.

CHOLERA

SYMPTOMS.—There is no desire for food, but the bird is decidedly thirsty and sluggish. The first discharge from the bowels is usually thick, but as the bowels become empty the discharge gets less solid and quite watery and yellowish. As the inflammation of the bowel lining increases there appears slight, bloody streaks in the discharge, and this may increase until the droppings are nearly pure blood.

Severe cases show some irritation of the throat and nostrils, a slight discharge appearing in the mouth and eyes. At the end of the first day you may expect to find the bird decidedly weak. The comb gets darker than in health, passing from red to purple as the disease progresses.

CONTROL.—Treatment of sick birds is not practical. On finding sick or dead birds proceed immediately as follows:

1. Place dead birds temporarily out of reach of other birds.
2. Make sure the trouble is fowl cholera and then kill all sick birds by dislocating their necks.

3. Burn with oil or bury at least three feet deep all dead bodies and all yellow and green excreta that can be gathered.

4. Place one 7.3 grain mercury bichloride tablet in a gallon of drinking water in a non-metal container or use one 30-grain sodium sulphocarbolate tablet per gallon water. These tablets are used only when the disease is present and then never more than 10 days at a time.

TREATMENT.—Very often poultrymen are inclined to term bad cases of diarrhea as cholera. Genuine cases of chicken cholera are rare. But when fowls are infected with this disease treatment should not be attempted. Kill and burn the bodies of all infected birds. Clean out the building in which they are housed and thoroughly disinfect; the runs should be disinfected with quicklime.

OVARIAN AND OVIDUCT DISEASES AND PERITONITIS

This is a very complicated subject and will require a great deal of study in order to differentiate the primary cause of the disease when several parts of these organs are affected at the same time. During the last year a thorough study of the above diseases and their complications was made, and by very close observation ovarian diseases and oviduct diseases could not, in many cases, be differentiated; that is, which of them was the primary cause. These organs are very highly organized and very sensitive to disease, and when we think of the hen passing through the act of labor at least once

in twenty-four to forty-eight hours, we should not wonder that there are so many deaths due to diseases of these parts. As a general rule, these diseases are not recognized by the poultryman while the hen is alive. When she is dead, a post-mortem is not made. It is called going light or general breakdown or something else. If a post-mortem were made on all hens that died in the State of Missouri, poultrymen would be amazed that the number of deaths due to ovarian disease would reach nearly one-half of all other diseases put together, in mature fowls. Placing ovarian and oviduct infection with peritonistic in one class, it will be necessary to trace the source of infection. First, is infection along the oviduct, and entering at the cloaca end? Second, is infection or inflammation extending from the intestines or directly through their walls? Third, is it through the circulation? Fourth, is this ovarian trouble and the breaking down of the ovary caused by the white diarrhea germs? The hens which have this ovarian trouble are usually good layers. After death, we have found the white diarrhea germs in the ovaries of some of these hens. The ovary has the appearance of a white diarrhea ovary. It may be that these germs and the strain of laying break down the ovary, inflammation sets in, and peritonitis and death result. This has yet to be proven to be the fact, but this is a reasonable conclusion.

The frequent laying of eggs cannot help irritating the mucous membrane of the tract; and the contraction of the muscles while propelling or attempting to expell the egg will often rupture small blood vessels. Their being more or less bacteria present, the infection or inflammation starts at these places. The local inflammation or infection produces fever and both decrease the normal secretion of the oviduct. Even when the above occurs the funnel end of the oviduct takes up mature ovules and attempts to pass them. The membranes being dry and inflamed, the muscular contraction ruptures the yolk in some cases. At other times, yolks or eggs are broken by attendants handling the hen or they may break when hens fly on or off their perches. There may be an obstruction to the oviduct by foecal matter packed in the rectum or there may be a growth in some part of the oviduct. When the egg ruptures, parts of it pass both ways, back into the body cavity and out the normal way. With this material, bacteria are also carried and peritonitis and intestinal inflammation are the result. A large amount of egg material may remain in the oviduct, as is found a great many times. It is coagulated and may entirely fill the distal end of the oviduct. In other cases eggs are shelled and pass back into the body cavity. If this is the case, then bacteria can also pass the same way, as well as the spermatozoon.

It is also found that when hens are suffering from other diseases, the ovaries are inflamed and some fully formed or partly formed ovules are partly re-absorbed and still left in the follicle. These yolks in many cases are also found partly cooked in the body cavity. This is caused by the fluid part of the egg material being re-absorbed by the tissues, leaving the solids. The infecting material in the follicles gets there through the blood stream or by direct contact. The ovarian follicles are very vesicular and when they rupture there is a degeneration or re-absorption of these vessels and tissues. These blood vessels and blood go through the process of thrombosis to a certain extent; and this may be the starting point of trouble.

Normal egg material may be absorbed about as fast as the ova can mature. During the last year several hens in this condition were killed in our laboratory. They went on the nests, but did not lay. When opened, normal and fully developed ova were found in the body cavity, others were ruptured, while others were still in the follicles and about to rupture. In these cases it was found that the oviduct was either closed by sear formation or contraction or closed by some tumor. These prevented the exit of the eggs, or external material from getting back into the body cavity. In these and in infected cases, an interesting fact was discovered. By the aid of the microscope particles of egg yolk could be seen in the white blood cells. It shows that if blood cells can take into themselves particles of egg yolk they can also do the same with bacteria and carry them back into the system. It was also found that in the latter case, when the hens were apparently well, there was none of the coagulated egg yolk, as in cases where hens had fever.

There are specific germs or a germ that the hen is susceptible to, or rather, is not exempt from. By chance, if these germs are present when one of the foregoing pathological conditions occur this germ begins its work. We have taken some of the infected material from several hens that were suffering from an infection of the ovaries and oviduct. It was injected into twelve other hens, pullets and cockerels and in different parts of the bodies. All became ill. Seven of them died and five slowly recovered. In all cases there was a local pus formation, with inflammation, languor, stupor, loss of appetite, and great thirst and fever. They would usually favor the afflicted side or limb or lie on that side. Some would act as if broken down in the back, as is mentioned by some books; others would sit down or act as if bearing down. They would stretch their heads out and throw them to the side, as if suffering pain. There was also diarrhea, very often of a yellowish color. In hens that died and were laying before or at the time the material was injected we found the ovaries, oviduct and peritoneal cavity in the same condition as in the hen from which the material was taken, namely, coagulated egg yolks, some of the follicle ruptured, and the yolk partly absorbed in some follicles, and of a darkened or greenish color.

Some of the material was taken to the laboratory and germs were isolated. These germs were reinjected, and in two instances the same disease or result was produced, while some of the other germs were injected under the skin in quite a number of birds with no effect. Thus far we have no specific remedy. The hens should be placed in a dry, warm room, well ventilated and kept very quiet. Where there is very frequent bowel action and pain, ten drops of the tincture of camphorated opium may be given, several times a day. Allow some pure water or add some zinc sulpho carbolated to the water. It prevents fermentation in the fowl. After a day or two give a dose of salts or oil. Then begin to feed lightly on mash or sour milk. In case of the egg material coagulating in the oviduct or shelled egg passing back into the body cavity, poultry surgery will have to be resorted to. The same may be done in the case of ruptured oviduct.

Gangrene may result in the inflamed oviduct or in a twisted oviduct. It may also result from the impacted egg in the uterus. There is no remedy for this condition unless the case is diagnosed early. This, however, is not the case generally, except in the prolapsed oviduct. In the latter, sponge the parts well with carbolized vaseline or olive oil, then by gentle pressure force the mass back while holding the hen with head down. If there is an egg in the oviduct inject olive oil, then pass the finger into the oviduct to guide the egg and with thumb and forefinger of the left hand make pressure on each side of the body and back upward toward the cloaca. If you cannot remove it in this way, break the egg and at least remove all the shell. In case of egg bound, without prolapse, inject olive oil into vaginal part of the oviduct, then allow hen to attempt to expel the egg herself. Either method results in congestion of the parts and endangers the hen.

PERITONITIS

The Peritoneum is the thin membrane which lines the abdominal cavity of the bird and covers the internal organs. In cases of inflammation of the intestines or egg organs, liver and kidneys, the inflammation usually extends to the walls of the body cavity, or if the peritoneum is injured or bruised, or some foreign body drops off into the body cavity, such as egg yolk or egg shell, this will cause inflammation and peritonitis will frequently result.

If the walls of the intestines are punctured by worms, or disease eats through, this allows the fecal matter to pass into the body cavity and a severe inflammation will result. If the yolk fails to be taken into the oviduct, it passes into the body cavity and peritonitis will often result. In some cases the yolks or eggs are re-absorbed by the peritoneum, but practically three-fourths of the fowls that are affected with peritonitis die as a result thereof.

The sick birds have a high fever and the abdomen appears hot, swollen and tender. The bird appears to be in severe pain and shows evidence of considerable thirst. The fowl gradually becomes weaker and it is unable to stand and the head is often outstretched in front of the body with the eyes closed, and the bird breathes rapidly and heavily,

When the bird dies and a post-mortem examination is made, the peritoneum and intestines will appear to be cemented together and covered with a whitish or yellowish material. This yellow, cheesy matter is really pus.

These diseases as a rule are brought on by the over-feeding of foods too rich in animal protein or egg forcing elements, such as high percentages of meat meal, beef scrap, fish scrap, gluten feed, etc. As a rule, it is more prevalent in the younger pullets that have just come into the laying period, more so than the older hens. In most cases it is caused by diseased egg organs, organs infected with white diarrhea germs. The organs become weakened by concentrated forced feeding and this disease follows. It is brought on by feeding young birds too heavily on egg forcing foods before they are fully matured, which will cause a weakened condition of the fowl and the breaking down of the egg organs.

As a rule, the first symptoms of this disease are slightly ruffled feathers, very high fever, quick and hard breathing, rather whitish watery discharge, and in most cases a form of leg weakness, paralysis or helplessness.

Peritonitis of the blood is due to a breaking down of the ovaries or egg organs of the female, causing a seepage into the blood which poisons the system. The function of the liver is to take up this poison and pass it out of the system which possibly will show in a form of diarrhea. The liver in time becomes so contaminated that it results in death of the fowl.

The only treatment for this disease is to change your methods of feeding. Eliminate the egg forcing foods. Feed liberally on whole grains, giving a liberal supply of tender, succulent green foods at all times. Encourage exercise as much as possible and give your birds a rest which has long been needed.

Give the entire flock a dose of Epsom salts in the moist mash. The equivalent of $\frac{1}{2}$ teaspoonful per bird. Mix salts with just enough water to sufficiently moisten mash that they will clean up in from 20 to 30 minutes. Starve the birds one or more feeds before giving this treatment. Give one treatment each week until three or four treatments have been given, then decrease to one treatment each month thereafter.

In addition to this, give $\frac{1}{2}$ teaspoonful of nux vomica to each quart of drinking water. Give no other water for ten days, to two weeks in treating this disease.

ZURN recommends wrapping parts of the bird in wet cloths and to give tincture of aconite internally, two drops with a teaspoonful of water two or three times a day.

SANBORN recommends one grain opium pills twice a day to relieve pain and warm liquid foods, such as meat juice and milk in equal parts.

BREAKING OF AN EGG IN THE OVIDUCT

This may happen after the shell has been formed or partially formed, or even before the egg reaches that state of development. These ovarian troubles usually occur during the heavy laying season and are quite frequent among young pullets. They usually result in an inflamed condition of the oviduct, and if the bird does recover, you will sometimes find what appears to be a cooked yolk, surrounded by several layers of what appears to be cooked albumen and other matter. This collection of material is usually several times the size of a normal egg. They are commonly found in the oviduct and sometimes are discovered in the body cavity. We have seen other cases where everything seemed to be in a normal condition, except the broken egg in the oviduct and the dead bird. We have seen many other cases where peritonitis had set in, blood poison had resulted, and the walls of the body cavity were inflamed and the intestines apparently cemented together with whitish or yellowish material that resembled broken yolk and cankerous material. There is no remedy for this trouble, as it is not noticeable until the fowl is dead or near death's door.

RUPTURE OF THE OVIDUCT

If the oviduct ruptures in the albumen portion it will usually heal of its own accord. If the lower portion of the oviduct is obstructed for any reason, or if any portion of it is severely inflamed, it may rupture and allow the

contents to pass into the body cavity. In many cases peritonitis sets in and death usually results. The trouble is not noticeable until the bird has almost reached the point of death, and such cases are pronounced incurable. If the rupture is only small, it sometimes heals and the bird recovers of its own accord.

OVARIAN TUMORS

The egg organs of a hen are usually taxed to the limit, especially if the bird is a good producer. A good many tumors and cancerous growths are commonly found attached to the oviduct of a hen. None of these conditions can be successfully treated by a poultryman. In the first place it is a difficult matter to determine whether a hen has a tumor or not, until after her death. Even if you knew just what was wrong with the hen, an operation would be necessary, such as cannot be performed except by an expert.

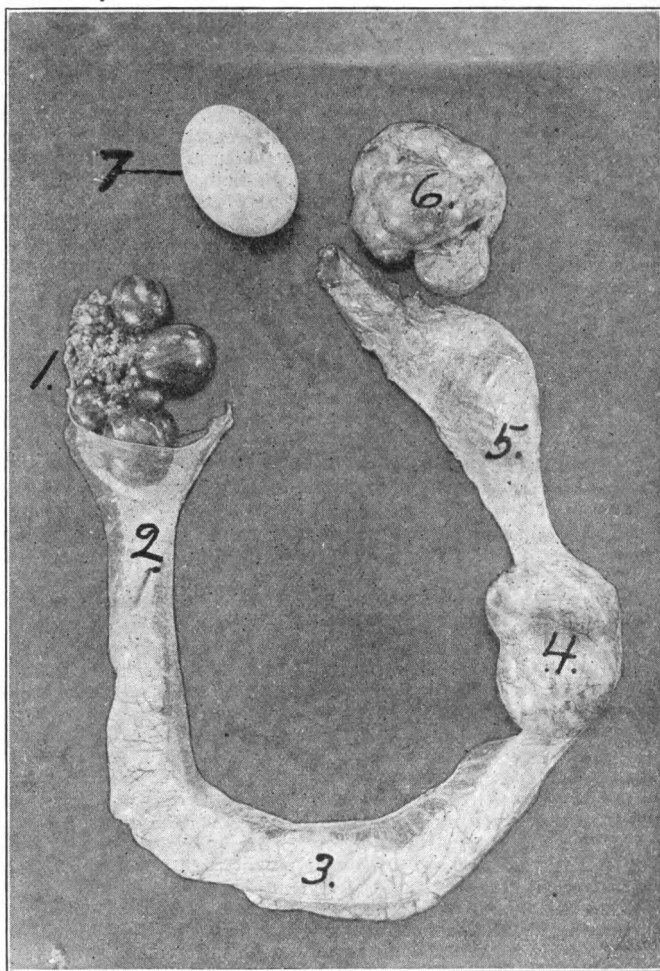


Fig. 35.

Showing the ovary and oviduct of a hen. There was a large tumor near the end of the oviduct which prevented the hen from laying. You can see two hard shelled eggs at No. 4. The tumor is No. 6.

EVERSION OF THE OVIDUCT

SYMPTOMS.—The oviduct protrudes from the vent and appears swollen and inflamed. It is caused by the muscles and ligaments of the oviduct becoming weakened. It may be due to the hen laying very large eggs, a pullet laying a large egg for her size, straining on the nest, or to constipation.

TREATMENT.—Wash the protruding parts with a pint of warm water, to which has been added a teaspoonful of zenoleum, creolin, or a similar disinfectant. Then grease with carbolated vaseline and replace the oviduct. Keep the bird in a dark, comfortable place. It is often necessary to tie the bird up by the legs and let her head and breast rest on the bottom of the coop. Keep her in this position for about twelve hours. Be sure to give the flock a dose of Epsom salts, $\frac{1}{2}$ teaspoonful to each fowl every week if you have much trouble with eversion of the oviduct.

PREVENTING SOFT SHELLED EGGS

The following was recommended to us by A. T. Burnham of Massachusetts:

1. Use very fine ground agricultural lime in mash—put in say 1, 2 or 3 pints in 3 gallons (measure) mash (damp mash).

2. Put in drinking water a gill or two of vinegar to 3 gallons of water.

We have used the following with good results: Use lime water as a drink. Any local druggist or physician can tell you how to make lime water. Allow no other water to drink. Add five pounds of fine bone meal to each 100 pounds of mash fed. Give more tender, succulent green feed. Reduce amount of forcing feed for a short time and feed more grain temporarily. If the thinness of shell is caused by a diseased egg organ or oviduct, there is nothing you can do to remedy the trouble outside of the things mentioned above. We would not breed from birds that had a tendency to lay soft shelled eggs.

EGG BOUND

SYMPTOMS.—Fowls so afflicted will often make frequent visits to the nests. The hen may walk about the yard and stop to strain as if making an effort to lay. They often walk with the abdomen close to the ground and their breast elevated and stand in a sort of upright position. They act as if in distress. The egg can often be detected near the vent by pressure with the fingers.

TREATMENT.—When hens are egg bound use a soft rubber tipped syringe and inject a tablespoonful of olive oil into the vaginal part of the oviduct. Be sure you get the oil into the oviduct. Then allow her to try to expel the egg. If there is a prolapse of the cloaca and oviduct, apply olive oil to the prolapsed part, then hold the hen with head down, and by gentle pressure force the prolapsed part back. Then place the index finger of the hand in the oviduct, and if there is an egg there guide it with the finger. With the thumb and finger make pressure on the abdomen toward the vent. If the egg cannot be removed in this way, break the shell, and when doing so, hold the hen with claca down, and also try to remove the shell, at least. Keep the hen in a dry, warm and quiet place. Let her have water and but little food for a few days.

FREAK EGGS AND THEORY WITH REGARD TO THEM

Fig. 14 shows a healthy ovary (No. 1) of a hen. A tumor (No. 6) caused an obstruction to the outlet of the oviduct and prevented the eggs (shown at 4 and 5) in the oviduct from passing out.

No. 1—Shows the ovary, the grape-like cluster in the back of the hen containing the ovules which develop into egg yolks.

No. 2—Is the funnel region of the oviduct where the yolk is received from the ovary. The mouth of the funnel is in the act of taking hold of an ovule or yolk. The chalazae is a thin layer of albumen similarly situated and twisted at each end, making a white cord-like mass on each side of the yolk extending into the white or albumen. These act like hammock cords and prevent the yolk from rising too rapidly through the albumen. Fertilization is supposed to take place in this portion of the oviduct.

No. 3—Is the albumen secreting section of the oviduct where the rest of the albumen is placed around the yolk.

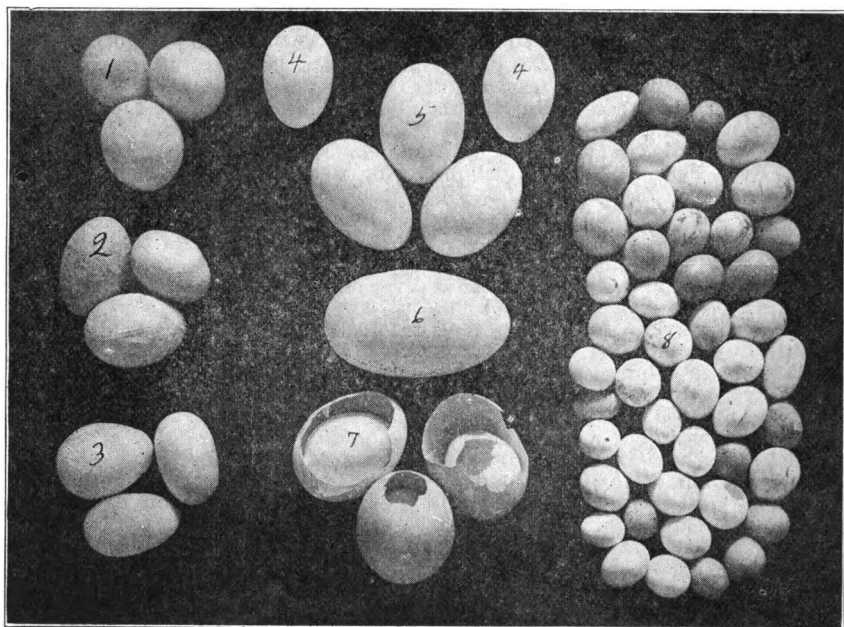


Fig. 36.
Freak Eggs.

No. 4—Is the isthmus; so called because it is smaller than either 3 or 5. There are two eggs at 4, which give it an enlarged appearance. In the isthmus the shell membranes are formed.

No. 5—Is the uterus, or shell forming section.

No. 6—As shown in the picture, is a tumor which prevented the eggs from passing out. The tumor is an obstruction, but the hen continued to produce eggs even though they remained in the oviduct.

No. 7—It is a hard shelled egg which passes the obstruction. Also, an egg partly shelled was at 5, and two soft shelled eggs at 4.

Tumors of this kind are not very common, and do not concern the average poultryman, as they are not contagious. Their removal by a surgical operation is the best remedy, if this is possible.

It will be seen from a study of the above figure that each part of an egg is developed in a separate part of the oviduct specialized for that particular work; that No. 4 is the section where the shell membrane or soft shell is formed.

Laying soft shelled eggs is thought to be caused by a lack of shell-forming material or by fright or by an irritation of the oviduct, but some are laid because of the hen's producing two eggs the same day, which possibly is accounted for as follows: Referring again to this illustration, it is thought to require about three hours in No. 2 and No. 3 (forming albumen), three No. 5 (forming shell).

It will be seen that No. 5 (shell-forming section) is the shortest section in the oviduct and requires two to three times as long to do its work.

When a hen is in good laying condition she can frequently produce two eggs in one day, but only a few hens are able to manufacture the shells for two eggs in so short a time; so, the first egg by means of the contraction

hours in No. 4 (forming shell membrane) and twelve to sixteen hours in of the oviduct is forced out, usually at night, and is found on the droppings board next morning. The second egg remains in the uterus and is shelled and laid next day.

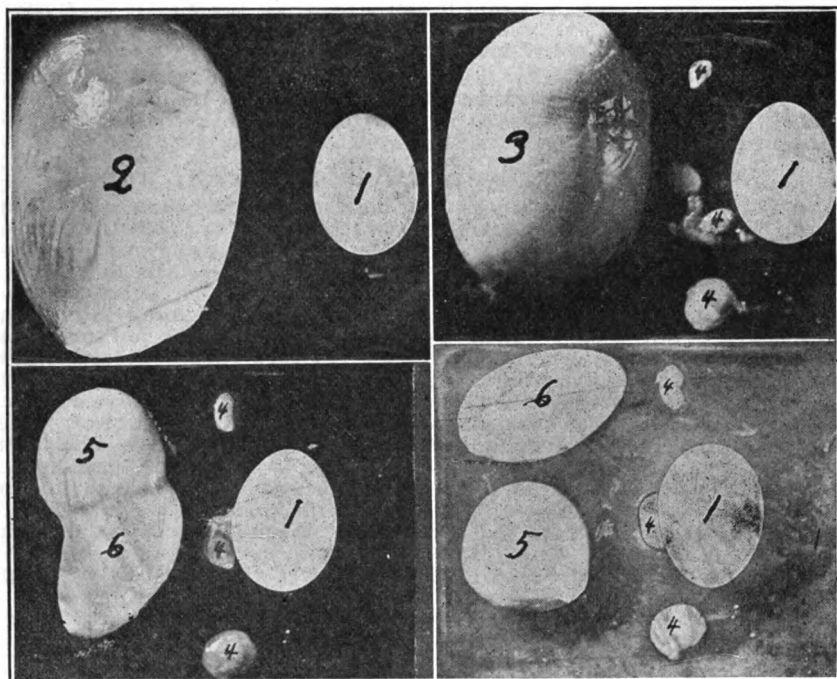


Fig. 37.

Abnormal and Freak Eggs.—No. 1 is an egg of normal size. A normal egg weighs about two ounces. No. 2 is an egg that weighed over 20 ounces, ten times as large as the ordinary egg. It has eleven separate and distinct shells. In the middle of the egg we found the eggs Nos. 5 and 6. The eggs could not be laid because of an obstruction and they were covered and recovered until they became so large that the oviduct was ruptured and the hen died.

Small eggs are sometimes caused by the yolk rupturing and a portion of the yolk material passing into the oviduct. This stimulates the oviduct and results in the formation of a small egg. A small portion of the chalazae, a blood clot or any foreign material passing through the oviduct will cause the hen to cover this with a tiny bit of albumen and a small shell. It is not true that the first egg and the last egg of the clutch are always small.

The irregular shaped eggs which we often find and the frequent laying of soft shell eggs is caused by an unnatural or unhealthy condition of the oviduct.

The small blood clots, which are often seen on the side of the yolk, are caused by the follicle or yolk membrane rupturing at a point where there is a tiny blood vessel. There is a thin streak in the follicle, which surrounds the yolk and holds it to the ovary, where there are no blood vessels. That is where nature intended that the follicle should rupture when the yolk is ripe, but very often the follicle will rupture to one side of this point and that often causes a tiny clot of blood to pass off with the yolk. This is really not objectionable as far as eating the egg is concerned. We often find this condition where hens are forced too much for egg production.

Very few soft shelled eggs are laid because of lack of egg shell material, as the hen will not develop the egg, as a rule, if she can't place a shell about it.

GOING LIGHT

SYMPTOMS.—Going Light gets its name from the rapid loss of flesh. At first you can't notice any symptoms of the disease. You don't realize the birds have it until you find they are very thin. Pick one up and you will find the bird very light and thin in the breast. As the disease progresses the affected birds do not follow the flock. They scarcely move about, appear sleepy, and if forced to move they stagger and fall.

TREATMENT.—You can do much to prevent this trouble by having clean and well ventilated houses and by avoiding the use of bad, moldy grain or litter. Disinfect thoroughly. "Going Light" is not so much a disease of itself as it is a symptom of some other disease.

"GOING LIGHT" OFTEN CAUSED BY INTESTINAL WORMS

Measure out just enough mash, all that the fowls will thoroughly clean up at one time. Moisten the mash with water and add to the mash one teaspoonful of Oil of American Wormseed (Jerusalem Oak) and one teaspoonful of turpentine, for every twelve fowls. Mix the ingredients thoroughly.

Before feeding the mash, the birds should be starved for at least twelve hours. We recommend feeding a light ration the night before and then in the morning no difficulty will be experienced in having the fowls eat the treated mash. Ordinarily, if the fowls are not very hungry, they will not eat the mash, for the taste of oil of wormseed and the turpentine is not pleasant. Feed the treated mash again in the evening of the same day. On the morning of second day a dose of Epsom salts should be given. The salts may be given in a mash. Dissolve six (6) teaspoonfuls of Epsom salts for every twelve fowls in just enough water to moisten the mash. The amount of mash used varies according to the breed of fowls and to the individual attendant. Moisten the mash with this water and then feed.

It is essential that the birds have before them plenty of clean, fresh water at all times.

This treatment as outlined is for adult fowls. Proportionately less of the materials must be used for the young stock. If there are only a few birds needing treatment, the following is recommended:

A paste is made up as follows:

Two (2) parts charcoal, by weight.

One (1) part turpentine.

One (1) part Oil American Wormseed or Jerusalem Oak.

Two four-grain (4-grain) capsules are given to each fowl for two successive nights and on the following morning four-fifths (4/5) of a teaspoonful of Epsom salts in sufficient water to dissolve the salts is administered. (Rather than use the salts, we prefer to give two four-grain capsules filled with powdered rhubarb and two four-grain capsules filled with common baking soda.)

RELIABLE REMEDY FOR WORMS

Many of our students use and recommend the tobacco treatment for intestinal worms. We have used it with very satisfactory results. This treatment is 2 per cent by weight of powdered tobacco dust in the wet or dry mash for three weeks, that is, use 2 lbs. of powdered tobacco dust to each 100 lbs. of dry mash. The fowls do not seem to mind the taste and eat as much as ever. This is given to the pullets when put in laying house and we are never troubled again.

Experiments demonstrated that tobacco dust fed in the dry mash is an effective remedy for round worms. No harmful effects on the birds have been found. Its use has caused no decrease whatever in the egg yield of the flocks. On the contrary, an immediate and constant improvement in the condition of the infected birds has resulted in increased egg yield. The birds do not seem to detect the presence of tobacco dust in the mash, and therefore relish it and consume their usual quantity without the necessity of applying starvation measures. The use of tobacco dust is recommended in flocks that are known to have round worms.

Tobacco dust should be fed in the mash daily for a period of at least six weeks in the proportion of 2 per cent by weight, or two pounds of the tobacco dust to each 100 lbs. of the ground feed.

And not only is tobacco dust effective where fowls are known to be

infested with worms already, but successful poultrymen use it as a preventive. They begin on chickens three months old, giving one pound to each thousand birds daily for three months, mixing it in the dry mash.

Get rid of the worms and allow the fowl its full strength and vitality to ward off or successfully fight the disease germs. Other treatments for worms are given in detail in Lesson No. 25 on "Enemies and Parasites."

LIMBER NECK AND WRY NECK

A bird is said to have limber neck when it loses control of the neck muscles. The head falls forward, sometimes resting on the ground between its feet. In cases of wry neck the head is twisted to one side or drawn convulsively backward. It is an affection of the brain, frequently caused by an injury of the head. Birds usually contract limber neck by eating decaying meats which contain ptomaine poison, or it may be brought on by over-eating dry feed when the fowls do not have access to water, or any other cause which might bring on acute indigestion. The best thing to do is to discover and remove the cause.

CAUSE OF LIMBERNECK.—During the summer months considerable losses to poultry keepers are often caused by this trouble. Limberneck is a form of paralysis in which the bird loses partial or entire control of the neck muscles so that the head falls to the ground or the neck hangs limp. Limberneck has long been considered as a symptom rather than a disease and outbreaks of limberneck are commonly observed where the fowls have had access to partly decayed flesh. The exact nature of the trouble has not been well understood but observers have generally advanced the theory that some poisonous substance develops in putrid flesh which causes paralysis of the nerves controlling the neck muscles when eaten by chickens. Some poultry keepers have advanced the theory that the maggots which develop in dead carcasses in fly time would produce limberneck when eaten by chickens, while other observers have noticed that in many cases the chickens eat fly maggots without any apparent ill effects. Recent experiments at the University of Minnesota indicate that the maggot of at least one common fly is an important cause of limberneck in chickens, and the facts already noted by the Minnesota investigators open a field which may lead to further important discoveries with regard to the nature and cause of limberneck. In the Minnesota experiment limberneck symptoms were produced in a White Leghorn cockerel by feeding the maggots of the green bottle fly taken from the head of a hog which had died from paralysis. Larvae of this same fly taken from the body of the White Leghorn cockerel and fed to a Rhode Island Red chick caused death within a few hours from limberneck symptoms. Green bottle fly maggots taken from the Rhode Island Red chick and fed to a large guinea pig caused paralysis of the pig's hind quarters. In the Minnesota experiment maggots from the common house fly and from the blue bottle fly developed in the body of a limberneck chicken produced no ill effects when fed to other chicks, and no limberneck symptoms were produced by feeding chicks the larvae of green bottle flies produced on fresh meat. These experiments indicate that the green bottle fly is at least one important carrier of the cause of limberneck. The evidence seems to indicate that limberneck is particularly likely to develop in chickens when the green bottle fly eggs are laid in the flesh of animals which have previously died from paralysis. Further investigations may show that limberneck is transmitted by certain of the flies and may also show a relationship between limberneck in chickens and symptoms of paralysis in hogs and possibly in other animals. So far the Minnesota experiments have not suggested a cure for limberneck, but they emphasize the importance of keeping the premises clear of all decaying animal material which might provide a breeding place for the green bottle fly.

TREATMENT.—Limber neck is usually easy to remedy, but in severe cases of wry neck the only thing to do is to kill the bird. When first discovered in small chicks, they should receive a dose of from two to ten drops of oil of turpentine mixed with an equal quantity of sweet oil. Prepare a ginger tea, made by mixing one teaspoonful of powdered ginger with one-half cup hot milk and sweeten with a little sugar. Adult fowls may have from one to two tablespoonfuls at a dose, but small chicks require only one-half to one teaspoonful every hour or two. When they begin to show signs

of improvement, give a little thoroughly cooked rice, and follow this by feeding a limited supply of grains, and also furnish them with a plentiful supply of raw vegetables or green food of some sort. When symptoms of the disease are first noticed feed very sparingly for a few days.

We have been quite successful in curing cases of limber neck in mature fowls by the use of turpentine and sweet oil. Mix about a teaspoonful of turpentine with the same quantity of sweet oil, then moisten a little bread with this and force it down the fowl's throat. If the turpentine and sweet oil can be given in large capsules, so much the better. The treatment should be given for two days in succession. About every hour or two the head of the bird should be held upward, beak opened, and a spoonful of sweet milk poured down the bird's throat.

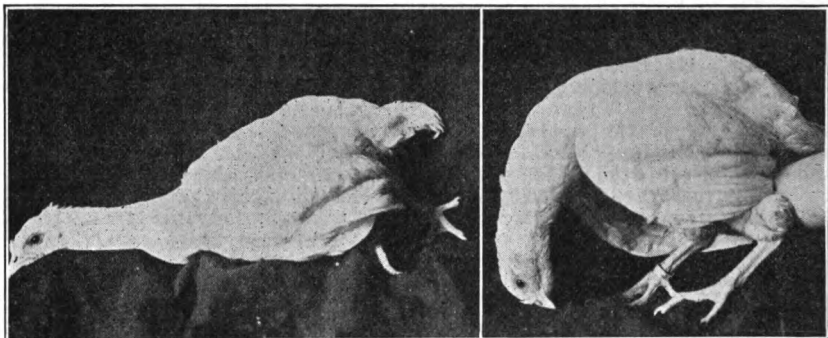


Fig. 38.
A case of Limber Neck.

VENT GLEET

SYMPTOMS.—Vent gleet usually has its beginning with the female, and by her is transmitted in copulation to the male, and by him to others in the flock. Upon examination you will find the mucous membrane in the early stages to be dry, red, hot and swollen. The tenderness and inflamed condition of the cloaca produces spasmodic contraction of the vent, and the bird endeavors to drop excrement when the cloaca is entirely empty. The first discharge is thin and watery, and later becomes white and offensive. This collects upon the skin and feathers about the vent and irritates the parts with which it comes in contact.

TREATMENT.—The most satisfactory treatment we have ever used is as follows: Take a pan of warm water, as hot as one can bear his wrist in, and pour in a tablespoonful of zenoleum or creolin. Hold the diseased portion of the bird in this water from ten to twenty minutes. Remove all the excrement or discharge which has accumulated on the feathers or skin, then inject a solution of permanganate of potash and water made about a rich wine color. Or you may inject a weak solution of warm water and zenoleum or creolin or a similar disinfectant. We dust all sore places after each bath with one part of iodoform to six parts boracic acid powder. After two or three weeks' treatment, if the birds show no sign of improvement, we advise killing and burning it. While the bird is being treated be sure to keep the bowels loose by giving Epsom salts every other day.

When nothing else would answer we have found the following remedy very simple and effective:

First of all, remove all affected birds to the hospital and disinfect. Give each affected bird a teaspoonful of Epsom Salts and after the bird has evacuated freely, mix the following:

Napthalene	10 grains
Sulphur	$\frac{1}{4}$ ounce
Nut Gall	10 grains
Carbolated Vaseline	2 ounces

Mix thoroughly and with it saturate a pledget of cotton and place it in the cloaca (rectum), allowing it to remain until expelled by the bird. Give internally five drops of turpentine, mixed with flour, twice a day.

DROPSY

This disease is recognized by an accumulation of a large quantity of liquid in the abdominal cavity. In some cases the abdomen becomes so enlarged that it is quite noticeable. Upon examination it is usually found to be soft and gives a sensation of a sack filled with liquid. In young chicks it may be brought on by bad feeding, unsanitary conditions or indigestion. In the older fowls it is usually caused by mild cases of Peritonitis or by a Tumor. In some diseases of the abdominal organs the birds are usually more or less listless and appear to be more or less feeble. It is usually best to kill birds thus affected.

Some cases may be cured by tapping the abdomen with a hollow needle and allowing the fluid to escape. Iodide of Potassium or Iodide of Iron in one-grain doses is recommended by some.

APOPLEXY

With this disease the birds usually drop dead or become paralyzed, having shown no previous signs of illness. Upon examination of the dead birds, the only evidence of any trouble that can be found is a clot of blood. In most cases this will be found on the brain and frequently in other portions of the body. Birds thus affected are usually overly fat and sometimes die on the roost. They often die while straining to lay, or will sometimes fall over dead as they stoop to pick up feed. Fright, over-exertion, or strain causes the blood vessels to rupture. Where birds have been allowed to become overly fat the walls of the blood vessels are degenerated and become very thin and tender, due to rich food or to over feeding. There is no way to treat such cases. Anything that is advertised or recommended as a cure for apoplexy is a fake. Modify your rations; reduce the amount given. Give more green food and provide plenty of range, if you have several successive deaths as occur from apoplexy.

HEAT PROSTRATION

In extremely hot weather where birds are being trap-nested, the hens may suddenly drop insensible or appear to be paralyzed. A condition approaching apoplexy results. As soon as such cases are discovered, the bird should be held under a hydrant and the cool water allowed to run over its head and body, or a tub of fresh, cool water should be drawn and the bird dipped in this until it shows signs of recovery. Provide a natural shade and protect your fowls from the extreme hot sun during the middle of the day.

TREATMENT FOR POISONS

You should be careful to protect your birds from poisons of any kind. If you use Mercurial ointment as a treatment for lice and use it too freely it will poison the system of your fowl, or if you feed sulphur in large quantities for any considerable length of time your birds will become poisoned.

We recently had three fine R. I. Red pullets sent to us by a prominent poultryman and when they reached our Experimental Farm two of them were in such a condition that you would not have thought they could live over night. All three of the birds would tremble when they attempted to stand; their heads and neck would move back and forth, and when they attempted to walk they could not do so, but would tumble on their heads, and could not even control their heads and neck so that they could eat, and their bodies were nothing except skin, bones and feathers.

Upon investigation, we found that the party had been feeding large quantities of sulphur and cotton seed meal for a considerable length of time. A great number of his birds had died during the past year and a half; all showing the same symptoms and he thought it was some very contagious disease. We gave each of the birds two 4-grain capsules, one filled with powdered rhubarb and the other filled with common baking soda. Two of these were given at night and two the following morning.

We also forced a long rubber tube or catheter down the bird's throat and into the crop. On the other end of the tube or catheter we had a small funnel and into this we poured equal parts of egg and fresh milk which had been beaten and thoroughly mixed. We saw that each bird got the contents of one egg and an equal quantity of milk each morning and night for the first two or three days. In two weeks' time the birds had fully recovered. This is a very good remedy for any kind of poisoning.

SETTING BROKEN BONES OF THE DOMESTIC FOWL

The first thing to do where bones have been fractured or broken is to replace the bones in as nearly a perfect position as possible so that the normal shape of the bone is restored. The next thing is to apply apparatus for holding the bones firmly in place until the broken portions can become united. In applying the splints or apparatus for holding the bones together, you must be careful to see that the circulation of the blood and the nerves are not interfered with. After the setting is completed, the bird must be provided with a clean coop in a dry, comfortable place, where it will not be interfered with by the other birds. Good food and water must be provided.

The feathers in the region of the broken bone, if there are any, must be removed. Then apply a thin layer of cotton, and be careful to hold the fractured part in proper position. Next apply about three narrow, thin, wooden splints, or more if necessary. These must be applied in such a way that they will not chafe the skin or make a sore spot. It is usually best to have the splints somewhat shorter than the bone that is to be repaired. The splints should then be wound with a one-inch cotton bandage and the end of the bandage should be sealed with a good quality of glue. Some adhesive plaster or glue must be used to run from the bandage proper, one end of same being attached to the bandage, and the other end to the skin or feathers of the bird so as to hold the bandage in place and not allow it to drop down or slip off of the fractured bone. The appliance used to hold the broken bones in position may be removed with safety by the end of the twelfth or thirteenth day. It may be necessary to examine the bandage occasionally to see that it is in proper position, and see that no unlooked for trouble has resulted.

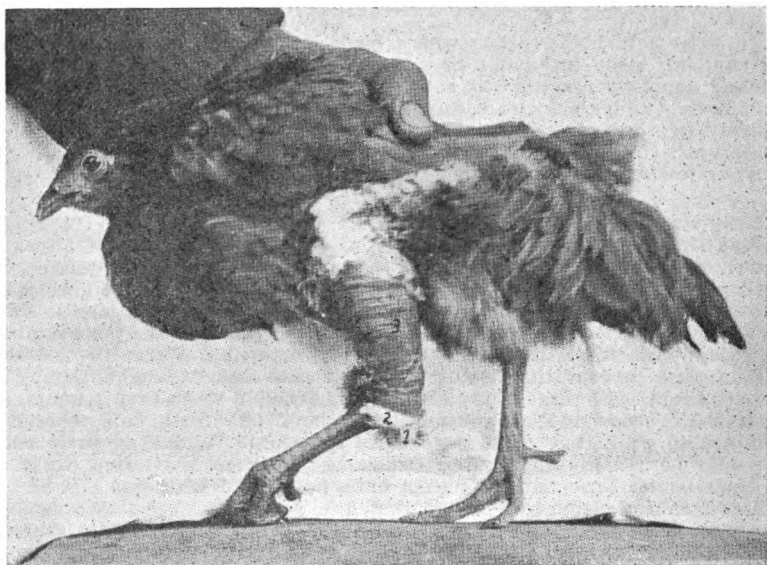


Fig. 39.

A four-months-old S. C. Rhode Island Red pullet with a broken tibia. Properly set, using splints (No. 1), cotton (No. 2), one-inch cotton bandage (No. 3), and glue.

It seldom pays to attempt to repair broken bones unless it is in the case of a valuable bird. Where it is thought wise to attempt such work, we would advise the method used and recommended by the North Carolina Experiment Station. The accompanying illustration was taken from their technical bulletin on this subject.

"This shows a fracture with adjustment and appliance in place. This is a fracture of a tibia in a three-pound Single Comb Rhode Island Red pullet. The appliance consisted of cotton, wooden splints, one-inch cotton bandage and glue. Glue has proven the most satisfactory.

"At the end of twelve or thirteen days, carefully remove the appliance, dissolving the glue or starch in warm water. Confine the bird for a few more days longer in a separate compartment.

"In feeding for the first two or three days it is well to feed mash or bread soaked in milk, and then gradually feed corn, wheat and oats, as for other fowls, and give milk or water to drink. If there are no internal injuries or other complications the birds will not greatly suffer.

"In applying the bandage to an open fracture, it is best to place a small piece of cork or wood over the wound and, after applying the dressing, cut down through the dressing and remove the cork. In this way a drainage window is established, and through this the wound may be treated daily with an antiseptic wash."

TREATMENT OF CUTS AND WOUNDS

Very severe wounds may be successfully treated by adhering to the following procedure:

"1.—Thoroughly wash the hands in warm water, using plenty of soap, before handling the wound at all. After the hands have been well scrubbed, rinse them thoroughly in a pan of one to one thousand bichloride of mercury solution and dry with a clean towel.

"2.—Pull out the feathers in the region around the wound and thoroughly cleanse it, using first warm water, and follow this with warm one to one thousand bichloride solution. A piece of clean, soft cloth or absorbent cotton may be used for this purpose. Make sure that the wound is thoroughly clean. Do not be afraid of hurting the bird. A little pain at the start is preferable to a dead bird later.

"3.—If necessary, sew up the wound, using a good size sewing needle and silk. Both needle and silk should be soaked in alcohol for fifteen minutes before using. Small wounds need not be sewed. Large ones will heal more quickly and more certainly if they are sewed. If the wound involves the muscles as well as the skin, sew it up in two layers one set of stitches including only the muscles, the other set only the skin.

"4.—Paint the skin in the region about the wound, but not the wound itself, with dilute tincture of iodine.

"5.—Powder the wound well with iodoform.

"6.—Smear a thick layer of the ointment over all.

"7.—If the wound is very severe bandage it with a clean cloth.

"The above treatment is only necessary in its entirety in very severe cases."

After all that has been said about germs and bacteria, it is astonishing how much fowls can stand in the way of infected wounds and bruises. Take, for instance, the process of caponizing. As a rule the instruments are not sterilized, not even the skin where the wound is made. The peritoneal cavity is opened and germs are carried in with the instruments and the wound left to close itself without any stitches. There is no reason why poultry surgery should not be practiced more than it has been. It can be carried out to a greater extent, and successfully, by using care in sterilizing the instruments and sterilizing the skin or place of operation before the incision is made. In case of tumors of the oviduct and in egg bound, instead of allowing the hen to suffer so long and letting her go in a weakened condition before something is done, learn the cause of her trouble in time and operate on her at once.

The accompanying illustration will show a Black Langshan hen which had six normal eggs in her body cavity. These eggs had passed to the

uterus and the shells had formed, but they could not pass out; so they returned to the body cavity. An incision was made as shown in the cut. The

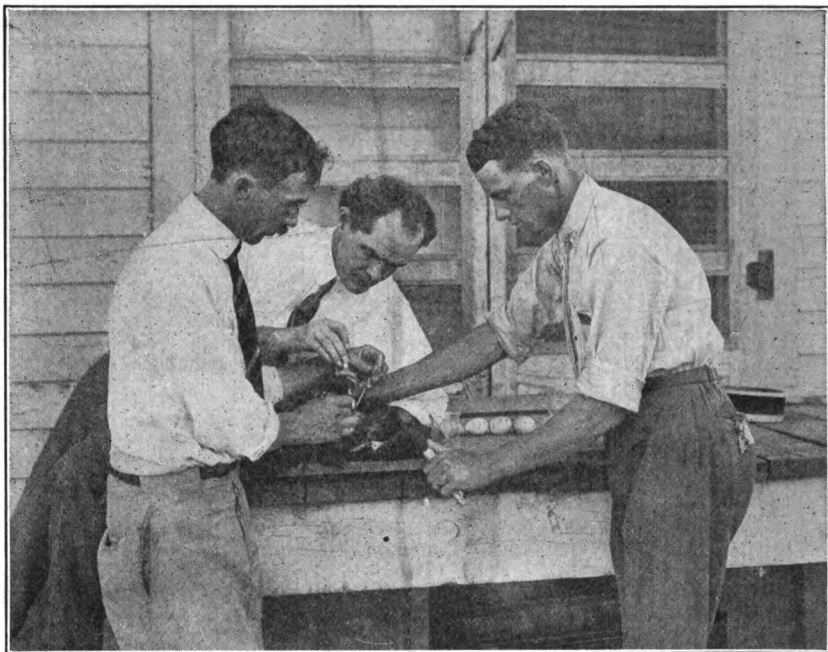


Fig. 40.

Removing six eggs from the abdominal cavity. The hen was soon laying again and in apparently as good health as ever.

eggs were removed, the peritoneal membrane was sewed together, also the muscles and skin. In six days the outer stitches were removed, and the hen was placed back in her pen, apparently well. She has since begun to lay. This was one of the National Contest birds and a valuable one. Several of her sisters died of the same cause before their trouble was discovered. The attendant was more observing in this case and learned the cause of the trouble in time. This and many other difficulties in the poultry industry can be solved, and the sooner all poultrymen get to studying these problems scientifically, the sooner they will be worked out.

TO PREVENT EXCESSIVE BLEEDING

Very often in operating on the comb of a bird that has been injured, or after the spurs have been cut off near the leg to prevent fighting, or after the beak of a bird has been trimmed rather close to prevent feather eating, the part may bleed freely and in some cases the bird bleed to death. In order to prevent this a stick of caustic may be used and applied to the injured part or a powder known as Tannic Acid may be applied to the wound. As a rule there is very little danger from excessive bleeding where the spurs of a bird are sawed off or cut near the leg.

BLACKHEAD IN TURKEYS AND WATER-FOWL DISEASES

It is impossible to cover this subject thoroughly so far as reviewing all the work that has been done in regard to these diseases. We refer our students to The Turkey and Waterfowl Lesson, which goes into detail regarding the treatment of these diseases.

DRUGS, THEIR VALUE, USE AND ABUSE

Dr. J. H. Pethersbridge comments on the value of drugs, their use and abuse as they appertain to the poultry industry, and his suggestions are so clear and valuable that we desire to give our students the benefit of this information as follows:

"I depreciate the employment of 'cruel' remedies; if you imagine no humane treatment will reach the trouble, don't torture them to death. Always keep a sharp hatchet in your medicine closet. I loath to recommend a *poisonous* drug, of either mineral or vegetable origin, for use with poultry, and believe in 90 per cent of the ills, it is ill advised.

"When I speak of a drug being a 'tonic,' I must not be misunderstood as saying that any tonic will atone for inherited lack of vigor. Or if I have occasion to refer to a drug as 'stimulating,' I do not mean that a stimulant will take the place of good food, well balanced and seasoned with pure water, fresh air, sunshine and exercise. And I desire you to bear in mind that no drug has the power to cure without the co-operation of care, cleanliness and common sense. And, finally, I desire to emphasize that in my recommendations of treatment and dosage, I will refer only to adult fowls and maturing stock.

"*Drugs*:—Extended notice given only to such remedial agents as are well known, easily obtained in any community and so cheap that their employment makes no material addition to the expense account. Drugs of high potency, valuable doubtless in the hands of an expert, but a menace on ordinary use without experience, drugs that are not dependable because of deterioration and chemical change upon exposure to light and air, and drugs difficult to procure and too costly for a profitable 'cure,' will only be referred to briefly or mention entirely omitted.

Sulphur

"No mineral is more widely diffused throughout Nature than sulphur. In volcanic deposits it is found in its purest state and called 'native,' though it is also abundant in combination with the ores of copper, lead and antimony, wherever these ores are found. Sulphur is also present in the animal and vegetable kingdoms. Among vegetables, the mustard and other cruciform plants show the greatest content of sulphur and the disagreeable odor of some plants, as garlic and asafoetida, is attributed to the sulphur they contain.

"The discoloration of the silver spoon with which you eat your breakfast eggs is caused by the sulphur in the eggs, and if one happens to prove 'bad' in the breaking it is the sulphur in the form of sulphurated hydrogen that salutes and outrages your olfactory nerves and takes away your appetite for that particular meal. A combination of crude sulphur, oxygen and water gives us sulphuric acid, invaluable in the arts and industries of the world. Sulphur is also in active demand for the manufacture of gunpowder, fireworks, in vulcanizing rubber, bleaching, and in combination with lime has grown almost indispensable as a spraying insecticide and fungus destroyer.

"The form of sulphur best adapted for use by poultrymen is known as the 'flowers of sulphur,'—a fine, yellow powder, having a slight characteristic odor and faintly acid to the taste. It is insoluble in water, but soluble in alkaline solutions, petroleum, turpentine, alcohol and others. Takes fire at a temperature of 300F. and burns with a blue flame, combining with it the oxygen of the air to form a vapor fatal to all living organisms if burned in a closed room.

"There is no surer way of killing the red mites than burning sulphur in a tightly closed house, but instead of sprinkling the powder on hot coals in a pan, I advise buying the sulphur candle, if procurable, as far safer for fumigation. But do not bid Biddie come back to her coop, after fumigating with sulphur fumes, until you have thoroughly aired the house.

"Before leaving the 'house' allow me to suggest that the next time you renew the dusting boxes, you mix with the 'dust' in each box 3 or 4 ounces of sulphur.

"Medical Properties.—Sulphur is a laxative and diaphoretic—that is, it is a mild cathartic and induces abundant perspiration. It is supposed to be

rendered soluble by the soda of the bile. It is also carried into the circulation by the fatty matters in the alimentary canal. It evidently passes off by the pores of the skin, as is shown by the fact that silver carried in the pocket of one taking sulphur becomes blackened.

"Medical value in the poultry yard.—The elder generations of my readers can recall the customary spring dosing of sulphur and molasses to every member of the family and if any dodged the morning dope, it was not the kids. It wasn't exactly peaches and cream to the taste, but it was 'good medicine' for a general spring cleaning, not infrequently needed, after a winter's diet of buckwheat cakes and sausage.

"To our mind this conveys a lesson of a possible poultry need after a winter of confinement and heavy feeding for eggs. As spring approaches, add to each quart of your dry or moistened mash a heaping teaspoonful of sulphur; mix thoroughly and repeat two or three times a week for a month.

"When your birds have free range and lots of it, the addition of sulphur to their mash is superfluous, as they obtain this element from the greens they select and eat, but an occasional addition to their feed through the winter months is desirable, as well as the spring treatment.

"Out of the southland, where chicken-pox or, as locally known, 'sore-head,' is almost epidemic in the fall, there has come of late a preventive treatment for this nasty disease, so often reiterated and substantiated, that it cannot be ignored. The treatment is as follows: About the first of July, once a week dissolve a tablespoonful of Epsom salts in warm water and with it moisten enough mash for a dozen chickens, every third day also add the same quantity of sulphur to their mash and keep up this alternate treatment until the first of October.

"I confess my training and experience gives me no clue as to *why* or *how* this treatment makes the flock immune from chicken-pox, but some things we only know by the results and cannot trace the processes by which said results are obtained. If a three months' course of salts and sulphur will prevent a visitation of chicken-pox, it is cheaper to accept the fact than question the theory.

"Northern poultrymen will do well to try this out, for this disease is growing more and more prevalent in all the Northern States.

"The Cost.—'Flowers of Sulphur' is inexpensive. It can be bought by the barrel for less than 9c a pound. When you go to the drug store for it, don't ask for '5c or 10c worth,' but buy it *by the pound*. It should not cost you over 10c per pound, but if you ask for '10c worth,' you are not likely to get more than four ounces. No, I am not insinuating that the druggist is dishonest; I am only, as a former druggist, putting you wise as to how to ask for and buy the cheaper drugs. As for honesty and fair dealing, the average druggist will not suffer in a comparison between him and the average poultryman.

Iron

"In the animal economy iron is an essential constituent of the red corpuscles of the blood; in anaemia the blood is deficient in iron not because there exists less iron in the red corpuscles, but because where there is anaemia there are fewer red corpuscles. One of the reasons why it is necessary to supply our 'shut-in' fowls with an abundance of 'greens' is the bird's need of the mineral salts the vegetables afford in an easily assimilated form. And chief among these minerals is iron. Greens particularly valuable for their iron content are lettuce, spinach and freshly cut alfalfa and clover.

"Iron is one of the few metals which are not deleterious to the annual economy. It is pre-eminently a tonic in run-down conditions and blood impoverishment from any source. It should not, however, be given to fowls suffering from any inflammatory disease, as it excites the circulation and will increase the fever, thirst and difficulty in breathing.

"Preparations of iron, available and desirable with poultry—the practical question arises—which of the preparations of iron are best adapted to promote the formation of the red content of the blood, are most easily assimilated, readily obtained and inexpensive? Probably the most easily assimilated, is metallic iron, or as known in the drug store, reduced iron or iron

by hydrogen, administered with the food and not on an empty stomach. Dose to an adult fowl, one to three grains, twice daily in the form of a pill or powder.

"This 'reduced iron' yields the largest proportion of iron to the gastric juices, but there are two serious objections to its employment by poultrymen, —first, the labor and time required for the preparation and individual administration and, second, the difficulty, owing to its liability to oxidation and consequent deterioration, of buying a really good article of reduced iron and keeping it so. If, however, the poultryman has only a few birds that need treatment and he can procure from his druggist 3-grain pills of the carbonate of iron (Blaud's pills), made by a reputable manufacturing pharmaceutical house, we would advise purchasing a hundred pill package and giving each bird one pill a day. One hundred pills can be purchased for 25c. Probably, though, the preparation of iron that is most desirable for the poultryman's medicine closet, convenient, safe, active and inexpensive, is the tincture known as the tincture of the chloride or muriate of iron, or more often simply as the 'tincture of iron,' and obtainable in any drug store for from 5c to 10c per ounce. It is one of the most active and certain preparations of iron and can be given in the drinking water.

"Anaemia, which is a condition of the blood, characterized by lightness of color, loss of albumen and fewer than normal red corpuscles, evidence of which condition is shown by a light red or yellow comb and wattles, listlessness, poor appetite and failure to make normal growth or flesh. Fortunately anaemia is no longer common, owing to better care, and the knowledge that air and sunshine in sanitary surroundings are essential to the fowl's health. A teaspoonful of tincture of iron should be added to a pint of their drinking water and this should be continued for several weeks, gradually reducing the amount of iron given. To enumerate other or all diseases of poultry in which the administration of iron may be helpful is beyond the purpose of this article and superfluous, if you keep in mind that iron is emphatically a tonic. It is useful after all debilitating disorders to 'tone up' the system through the circulation. In using sulphur in the mash as indicated above, we esteem it a very desirable assistant to the sulphur to occasionally add a teaspoonful of tincture of iron to the drinking water.

"*Caution.*—Do not mix or combine tincture of iron with any vegetable tincture, for the iron will be thrown down in the shape of insoluble tannates. We consider this caution necessary, for we frequently see recommended in the disease department of poultry journals the use of iron with nux vomica and even belladonna, and as those are drugs of high potency, such combinations are particularly dangerous.

"Do not attempt to give your fowls a course of iron treatment by placing iron nails or filings in their drinking fountains; the resultant yellowish-brown deposit on bottom and sides of vessel is only rust and adds no medicinal value to the water.

"Do not imagine that by dissolving copperas (the impure sulphate of iron) in their drinking water you are giving them an iron tonic. When iron is combined with a mineral acid, such as sulphur, phosphorous, etc., the best authorities claim that the combination adds no iron to the blood but acts solely as an astringent. Copperas is by no means a safe internal remedy for poultry; in solution in water it is a powerful disinfectant and arrester of decompositions, but even in this connection it is considered to be of but feeble value as a germicide.

"Our interest was recently aroused by an article appearing in a well-known and widely circulated farm journal, giving a highly endorsed (by the correspondent) formula for an egg-laying compound. The principle ingredient was copperas with generous additions of venetian red and cayenne pepper and smaller portions of blue vitrol and saltpetre. If his birds didn't lay more eggs on that 'seasoning,' they should have shelled out a few bombs of 'red fire.'

"Cream of tartar is a mild saline cathartic and Rochelle salts (a tartrate of potash and soda) is also a cathartic of somewhat more vigorous action, but if you have occasion to use a laxative or cathartic for your birds, Epsom salts will cost you less and give equally good results.

"We have at sundry times in various poultry publications noted the advising of iodide of potash for rheumatism; it doubtless is good, if the treatment is sufficiently prolonged, but in view of its cost and the fact that rheumatic conditions can only exist or be developed under conditions of neglect or improper housing, the best remedy is to locate and correct the error.

"The chlorate of potash either alone or mixed with sulphur is sometimes recommended to be dusted into the throat in inflammatory, cankerous and diphtheritic disorders, and without question the action of these drugs on such surfaces is very efficient, but we think the better way of applying the chlorate would be to dissolve one part in ten parts of glycerin and swab it on the diseased membrane. And it is a safe rule to never mix the chlorate of potash with any other drug. Adhere to this rule and you will never invite an explosion.

Permanganate of Potash

"In visiting the poultry yards of the country it is surprising to see so many fowls being served with pink tea in place of pure, sparkling, fresh, clean water. In reading the advice tendered in the poultry press, considering the many diseases and conditions for which a solution of permanganate is recommended as a specific and cure, one is fain to infer that for poultry it is the 'elixir of life.' Owing to its popularity and its widespread use, it requires some moral courage to throw a doubt on its efficiency.

"In the writer's opinion, permanganate of potash is the most overrated drug in use by poultrymen. In consequence of the facility with which it parts with its oxygen, it is a powerful oxidizing agent, but as it can yield up only the oxygen within it, its powers are limited even in this field. It is efficient as a disinfectant in lessening and destroying fetid odors from organic substances.

"It may be kept indefinitely, if pure, and can be fully secured from contact with organic substances or other decomposing agents, but, in fact, in consequence of the almost universal presence of organic matter in the air, it is generally partially decomposed when purchased or in ordinary handling becomes so.

"It can have but little value as an internal remedy, given through the medium of the drinking water, for even allowing that exposure to the air has not affected it, the saliva of the mouth and the secretions of the gullet and stomach will decompose it before it can be absorbed.

Lime

"It is highly essential for us to know the importance of the minerals involved in the fowl's organism, their economical sources of supply, and be able, in a measure, to recognize and interpret the distress signal that an abnormal condition invariably applies. True it is that the well bred fowl with unlimited range and natural environment finds and appropriates without direction of ours, all those mineral elements that it stands in need of, but in these 'shut-in' and 'intensive poultry culture' latter days, hundreds of thousands of our birds are handicapped (or rather foot-bound) and entirely dependent upon our discernment and knowledge with but little opportunity to exercise their instincts.

"Although but 5 per cent of the body weight of the fowl consists of mineral matter, this seemingly small percentage has most important functions to perform in the upbuilding and support of the bony structure and in the regulation of the density of the blood and digestive fluids of the stomach and intestines. The main source of supply of this mineral matter lies in the grain, the mash and the greens we feed them, but in addition to this organic mineral matter, a certain amount of inorganic matter is required for the formation of the egg shell and the proper development of the frame in the immature bird. In most situations this must of necessity be an artificial supply and as the mineral most in demand is lime, crushed shells, grit and ground bone may be our main reliance. It is asserted that one pound of oyster shells contains sufficient life for the shells of seven dozen eggs.

"*Calcium Carbonate* is the most abundant and widely distributed calcium salt in Nature. Familiar to us in the form of limestone, shells and chalk,

The subjections of limestone and shells to intense heat, drives off the carbonic acid and gives us an oxide, the lime of commerce, or as familiarly known, 'quick lime.'

"The value of crushed shells kept in a hopper before the flock is mainly to supply the females with shell making material for which purpose nothing can be cheaper or better. As a mechanical aid to digestion, crushed shell also fills some of the functions of grit, but as a bone builder, I am disposed to think shells have but little influence, there being in bone less than 4 per cent of the carbonate to 57 per cent of the phosphate of lime.

"Chalk is a native friable carbonate of lime and the world's supply comes largely from the chalk cliffs and beds of England, France and the United States. There is no pharmaceutical product of chalk I can recommend for the poultry trouble with diarrhoea accompanied by acidity. Freshly prepared by the druggist, a teaspoonful of 'Chalk Mixture' poured down the throat of the ailing bird at intervals of two or three hours should remedy the condition in a day's treatment unless there happens to be other more serious complications.

"*Quick Lime* is soluble in about 700 parts of cold water. A little water sprinkled on lime is rapidly absorbed, with the evolution of much heat and vapor. This constitutes the phenomenon of 'slacking,' the first step in 'white-wash' preparation. And allow me to interlope, if you should have a bird you believe is suffering from diphtheretic roup, and you haven't killed it because it cost you good money, hold it head downward for a few seconds over the heat and vapor of some 'slaking' lime; do this several times at intervals long enough for the sufferer to get a breath of fresh air in its lungs, and you may effect a gratifying 'cure.' For use, however, as a disinfectant, purifier and for the soil, lime is better 'slaked' without the addition of water, by simply exposing it to the atmosphere, and this we know as air slaked lime. The addition of one or two handfuls of air slaked lime to the sifted coal ashes many use on dropping board and in dusting box, will destroy all offensive odor and materially aid in routing body lice. The lime should be sifted and the lumps discarded for these may be unslaked and if eaten by the chickens will do serious damage to the digestion. In event that any of your birds give evidence of bronchial trouble cease using the lime for a time, as lime dust is extremely irritating to the air passages.

"There is no more effective soil sweetener or disintegrator of heavy clay soils than air slaked lime. Before spading or plowing up poultry yards that have become foul by long usage and lack of growing vegetation or infected by a visitation of a contagious disease, give the yard a heavy top dressing of air slaked lime and turn under; let it rest for a few weeks with several stirrings up with harrow or rake, and grow a green crop upon it before again using it as a run.

"*Lime Water*.—Two ounces of quick lime, slake with 4 ounces of water in a gallon bottle, agitate frequently for an hour with the addition of a half gallon of water, allow to settle and pour off this water. Then again fill up the bottle with fresh cold water and again agitate; cork tightly and set aside until use arises for it. Lime water is a valuable antacid and astringent and the clear solution in the bottle may be given full strength to the poultry in one of their fountains (but not metal ones) for the same purpose for which I recommend chalk mixture.

"For quick relief to a burn, mix lime water and linseed oil half and half, and apply freely to the burned surface.

"*Sulphate of Lime*.—The combination of lime native in the different varieties of gypsum rock, hence the common name of gypsum for the crushed and ground crude, impure sulphate. It is also designated as land plaster. It had no medicinal use as an internal remedy, but is utilized by poultrymen as a deodorizer and absorbent under the roosts. Valuable to the agriculturist as a fertilizer—either alone or in combination with other chemicals, indispensable to the mechanic in many divers employments, sulphate of lime is worthy of more extended notice.

"*Phosphate of Lime* is the principal mineral content of bones. Burned to a white ash, the residue shows over 57 per cent of phosphate of lime, and

it is from this source we obtain phosphorus and all its compounds directly or indirectly. To furnish our flocks or individual birds, therefore, with the phosphate of lime, absolutely essential to the formation, growth and maintenance of their bodily structure and proper nutrition, I believe we need look no further than this original source of all other compounds of phosphorus acid and lime.

"The precipitated phosphate of the drug store, the hypophosphite, the lactophosphate and the phosphide of lime, all have their distinctive application to the needs of human organisms, but they offer no remedial or constructive elements to our birds that a good quality of bone-ash, bone-meal and granulated bone does not afford at one-tenth cost. And the highly important score of economy must never be lost sight of in our selection of remedial agents for domestic animals we 'raise' for profit.

"*Bone-ash* is the mineral residue of burned bones, the heat destroying all animal matter and driving off the carbon.

"*Bone-meal* is the dried ground bone, varying in fineness from flour to the granulated and retains all the animal matter.

"It therefore follows that whereas bone-ash offers the greater proportion of the phosphate, it lacks the food value of the meal and granulated bone.

"*Leg Weakness* in chicks and growing stocks. While there may be and in most cases are contributing factors such as too warm floors in the brooder, imperfect ventilation, too close confinement, lack of exercise and overcrowding, the underlying cause of leg weakness is feeding a ration too rich in fat and flesh forming constituents and too poor in ash and bone-making material. The chicks gain in weight faster than they acquire strength.

"The amount of corn and corn products should be lessened materially or for a time discontinued. Every mash fed, whether dry or moist, should contain the best quality bone-meal you can procure to the amount of 2 pounds in a 25-pound lot. And I would further recommend that in addition to the individual hoppers of grit, charcoal and shell you add one for granulated dried bone. (I do not advocate green cut bone or blood-meal for immature stock).

"*Chlorinated Lime* (Chloride of Lime—Bleaching Powder.)—I presume there is not a reader but knows the familiar one-fourth, one-half and one-pound pasteboard or metal boxes in which this valuable disinfectant, deodorizer and germicide is offered for sale, but it may not have occurred to some why it is not sold in bulk. Owing to the readiness with which it parts with the chlorine upon exposure to the air, it rapidly deteriorates if kept in other than sealed containers. The value of chloride of lime, for the purposes named, depends upon the chlorine gas content. It is said that chlorine if present in the atmosphere in even the small proportion of 1 to 100 is able to destroy all disease germs, provided the air and the objects or substances to be disinfected are moist and the room tightly closed for a time. This offers a convenient and cheap method of disinfecting poultry houses that can be closely closed, involving less labor than usually called for in the use of other agents. Particularly so, if your water supply permits the service of a hose to thoroughly wash down all the interior.

"Ridding the house of excess water, but while everything is still damp and the air moist, sprinkle chloride of lime around liberally and close up house tightly for several hours. Then open up, sweep out the lime and allow the sunshine and air to complete the job.

"Open boxes of chloride of lime should not be permitted to stand around the poultry house for deodorizing purposes; it soon becomes valueless for this purpose but always remains a menace to your birds in that, taken internally, it is a corrosive poison.

"*Calcium Sulphide* (Sulphuretted Lime).—A combination of lime and sulphur that is highly recommended for the treatment of canker, diphtheric condition, chicken-pox and sore-head. As a local application for pus formation, canker and diphtheria, it is applied directly but sparingly to the diseased membrane by means of a glass or metal tube.

"Upon the first indication of an outbreak of chicken-pox in your flock (and its appearance upon one cockerel or cock is sufficient indication, even if you isolate him immediately) the 'American Poultry Doctor' advises the

thorough mixing in the moist mash, once a day, of 1 grain to each adult bird and the treatment kept up for a week. Half grown birds, $\frac{1}{2}$ grain. The application to the sores of any good coal tar ointment and a thorough cleaning up and disinfection of the premises, with a material reduction in the amount of 'meat' fed while under treatment, in addition to the calcium sulphide, is said to control and cure this nasty and far too prevalent disease.

"Calcium sulphide may be purchased through your druggist in one or four-ounce bottles, the latter package retailing for about 50c. If the top portion in the bottle shows a lighter color, throw this part away, for it is probably inert.

"Should you have no small scale upon which to weigh out the required number of grains, counting a grain for each bird, ask the druggist to place a daily portion in each of seven small vials, tightly corked. The additional cost is justified by the accuracy and activity assured. Much of the calcium sulphide on retail drug shelves is inert and valueless, because in stock too long or too often exposed to the air. Buy it only in the original container and insist upon a fresh article. Do not mix it with the mash until feeding time and if they leave any portion of the mash uneaten, remove and throw it away.

Soda and Magnesia

"*Carbonate of Soda*, familiarly known as sal soda or washing soda, appeals only to the poultryman as a cleansing agent, its medicinal value being better exhibited in the bicarbonate.

"Galvanized iron hoppers, troughs, brooders and drinking fountains are coming into more general use and are to be commended for cleanliness and durability, but they nevertheless demand occasional thorough cleansing. Make a strong solution of sal soda in a tub of hot water, immerse the utensils with a small mop (for sal soda is bad for the hands) wash thoroughly in the soda water, rinse in clean water, and set in the sun to dry and sweeten. You can clean a tin can that has held rancid castor oil by this method and I know no other cheap cleaner that will accomplish this.

"*Bicarbonate of Soda*, better known as baking soda, being milder and more acceptable to the stomach than the carbonate, should always be selected for internal use or external application. It is preferable to the same salt of potash, as a simple alkaline remedy and antacid, because soda being the natural alkali of the blood and other liquids of the animal organism, has no general effect on the system.

"If from overfeeding or through the consumption of fermenting grain or soured mash, any of your birds give indication of having a 'sour crop' with resulting acidity of the stomach and intestinal contents, nothing will give them speedier relief than a teaspoonful of a solution of one dram of baking soda in an ounce of water. Two or three doses at intervals of three hours should relieve the condition.

"*Sodium Borate*, or borax, too well known for household utilities for a repetition in this place, but its value as a poultry remedy has not been so generally recognized and calls for brief mention.

"The properties of borax recommend it in poultry 'practice' consist in its being poisonous to the lower form of life, as exhibited in vegetable parasites, its antiseptic qualities and its soothing action on the mucous membrane, borax being nearly free from irritating properties. Borax being only slightly soluble in water, when so used as a wash, should be a saturated solution—that is, all that the water will dissolve.

"In treating favus or any scaly diseases of the skin, the head, the neck and any other parts of the body showing the scale or effects of same, as the loss of plumage, should be thoroughly washed with borax water and dried before applying the healing ointment or oil with which you finish the treatment.

"Borax water is further recommended for a wash for conjunctivitis, an inflammation of the membrane lining the inner surface of the eyelids, and to swab out the mouth and throat in ulcerated conditions. In the preceding suggestion, if you prefer, in place of the borax, you may substitute boric

or boracic acid—five grains to the ounce of water. The therapeutic action of the acid is identical with refined borax, but the latter costs less and is usually on hand.

"*Sodium Silicate*, the popular and trade name for same being water-glass. As an egg preservative, for the market poultryman of moderate production, the most convenient, economical and efficient cold storage trust buster available. Eggs preserved in water-glass for three months should in every respect compare favorably with strictly 'fresh laid,' provided they are fresh and clean when placed in the preservative solution. Preference should also be given to infertile eggs.

"One gallon of water glass, costing 50 cents, in 10 or 15 gallons of water, should be sufficient, in a suitable receptacle, to cover 50 dozen eggs, hence it should not cost over 1c a dozen to hold a few hundred dozen over a falling market.

"The water used for mixing with the water-glass should always be boiled, allowed to settle until cool. In insisting that only clean eggs be preserved, it was not intended that they be made clean by washing. This must never be resorted to in any method of egg preservation. The water-glass solution should overflow the top layer of eggs at least two inches.

"*Sodium Chloride* (Common Salt), recognized from the earliest antiquity for its essential usefulness to man and beast; frequently referred to in the Bible, both literally and figuratively, called 'divine' by Homer, and referred to by Plato as a 'substance dear to the Gods.'

"We all recognize the necessity of giving our domestic animals either ready access to salt or incorporating a small portion in the food. Do we do it simply because we feel that they have an instinctive relish for salt, that it will increase their food consumption by rendering it more palatable, or do we understand that salt plays a most important part in assimilation and nutrition?

"Salt is credited with materially increasing the number of red corpuscles in the blood and being instrumental in the upbuilding of the weight and strength of the body. If this be so, it tells us that though we may with no dire results occasionally omit the modicum of salt from the mash prepared for the adult birds, the omission as regards the growing pullets and cockerels may be more serious.

"It is possible, however, to give salt in excess; if made a regular addition to the mash, one-fourth pound to a hundred weight of mash is ample for health and nutrition.

"Salt assists digestion by furnishing chlorine for the hydrochloric acid necessary to the gastric juice.

"*Sulphate of Magnesia* (Epsom Salts)—The one magnesia salt, the container for which in the poultryman's medicine closet should never be permitted to remain empty.

"Allow me to suggest that if you wish to secure brilliancy of finish and increased whiteness in your next application of whitewash, to every ten gallons of wash add two pounds of Epsom salts dissolved in hot water.

"Epsom salts are well known as a safe, active cathartic, operating with little pain and nausea. They are more acceptable to the stomach than most saline cathartics and are retained when others are rejected. Particularly desirable as a laxative and cathartic in treating poultry, because it may be dissolved in hot water and the solution used to moisten the mash, thus insuring a fairly even distribution among the flock and yet avoiding the labor and saving the time for individual dosing.

"The dose should be from half to an eighth of a teaspoonful of the salt for each fowl, depending upon whether an active thorough purge is indicated or only a mild laxative action. And it is as the latter, administered periodically to all 'shut-in' flocks, that I desire to urge the employment of Epsom salts. Where but one or two or a limited number of birds give indication of an acute disease of intestinal character, as diarrhea, congestion or inflammation of liver, enteritis or limber neck, and an active, speedy cathartic is needed to thoroughly evacuate the bowels, in preference to salts, I would recommend a teaspoonful of castor oil poured down the throat of the indi-

vidual afflicted bird; however, as such an active purging is apt to be followed by constipation, it will be well for several days following to mix a small laxative dose of salts in the mash.

"Birds on free range, during the green-growing months of the year, require no laxative drugs nor, for that matter, rarely any other dope. Animals in their natural habitat make no mistakes of diagnosis and in the open readily discover the medicine they require.

"During the shut-in period, and under the artificial environment that many flocks must live in from incubator to oven, they are dependent upon us for the service they are barred from performing for themselves. As many and possibly more eggs can be produced from housed and penned poultry, but on the other hand you increase their susceptibility to many disorders to which they would be entirely immune on free range and enhance the practical value of suggestions here offered.

"Within a month from the time of confining your birds to the laying house and scratching shed, I would recommend that for every six birds in your flock you dissolve a teaspoonful of Epsom salts in hot water and with the solution moisten the morning mash every fourteenth day during the entire shut-in period. Whether the droppings appear normal in color, consistency and quality need not be considered for the gentle laxative dose advised can do no harm to apparently healthy birds. The fact of the case is, that whereas we at once recognize abnormal conditions of color and consistency in the droppings and from other indications are able to detect the individual responsible and isolate her for special treatment, a condition of constipation in the flocks can often continue for some time without notice.

"This condition is particularly menacing as spring approaches, not because of the coming spring but because of the culminative effect of a winter of heavy feeding, limited exercise and possibly an insufficient supply of succulent greens. Spring calls loudly for bodily cleaning as well as house-cleaning and the whole process of the former activity centers around elimination. The winter's accumulation must be cleaned out, the liver made active and the blood revived, and no artificial remedial agents will do better work to give quicker results than laxative, alternating doses of Epsom salts and flowers of sulphur in the mash with due regard to a judicious, gradual change to a lighter ration.

"If you deem the bi-monthly dose of salts during the winter months unnecessary, I urge strongly that in the early spring you resort to it bi-weekly for a month and the days that you do not use the salts incorporate a tablespoonful of flowers of sulphur in each quart of mash. It is not only safe, sane and timely treatment, but largely preventive of many summer ills.

Disinfectants

"Cleanliness and the periodical use of a good disinfectant are our best safeguards against disease and vermin. But the too common idea or conceit that the more we can pollute the air of our chicken houses with ill-smelling disinfectants, the more sanitary we make them, is an unfortunate and costly conclusion. A thorough cleaning up should precede the use of a disinfectant, and after cleanliness must become habitual for effective prevention. Once free from disease germs and parasites, we can depend upon whitewash and sunshine as our best and sweetest disinfectants if we are willing to lay on the one and let in the other.

"Another common mistake is failure to recognize that there is a vital difference between a disinfectant and a deodorizer. A deodorizer does not kill the disease germs, but simply substitutes one odor for another, and not infrequently gives us a sense of false security.

"Among products in general or occasional use as disinfectants may be mentioned carbolic acid, lime, sulphur, zinc, permanganate of potash, kerosene, benzine, naphtha, formaldehyde, turpentine and numerous petroleum and coal tar compounds sold under sundry trade names. All of these substances and products have their proper uses and distinctive values, and whereas without exception they are capable of destroying insect life when

brought into direct contact with it, are not all true germicides, and some of them are far from being safe disinfecting agents for the poultryman because of their poisonous qualities and inflammable nature.

"Coal or Gas Tar"—This prior to 1836 was considered only as waste and a refuse embarrassing to get rid of by gas and coke manufacturers. In that year, however, a chemist by the name of Runge gave the world a product from this waste material, which he named carbolic acid, and in no succeeding year have the wizards of commercial chemistry failed to give to the arts, industry and medicine new and wondrous products from this same source.

"Carbolic Acid" is a phenol, hence is sometimes called 'phenol,' it is not, however, a true acid, but is more nearly related to the alcohols. As first obtained from the tar it is a reddish-brown oily liquid and consists of phenols, cresols and hydro-carbons in varying proportions. This is the commercial impure or crude carbolic acid and is the product I desire to recommend to poultrymen as equally efficient as a disinfectant as the pure carbolic acid, less dangerous in use and many times cheaper.

"Pure carbolic acid is obtained by repeated distillation of the 'crude' until deprived of all the cresol content, and pure cresol should contain no phenol or carbolic acid, but the commercial or crude forms of each have many constituents in common and serve equally well the same purpose as disinfectants and antiseptics. In fact, much of the commercial cresole is identical with crude carbolic acid.

"The selling price of the crude carbolic acid varies greatly according to its guaranteed phenol content, the strength generally carried by retail druggists is from 20 to 25 per cent and the selling price about 25 cents a quart.

"Pure carbolic acid in liquid form, applied undiluted to the skin, causes a sharp pain, followed by numbness and a whitening of the cuticle. In contact with the mucous membrane, its action is the same. Given internally or applied externally in excess, it is a most fatal, rapid acting poison.

"The 'crude' has the same qualities, though of course to a lesser degree, and hence is not a safe internal remedy and its use of the fowl undiluted or in strong solution is not without danger. Its most important function as a therapeutic and sanative agent is its destructive influence of the lower grades of organic life, both animal and vegetable.

"Chlorine, fromine and permanganate of potash are more powerful than carbolic acid in disguising the odors of putrefaction, but the action of the acid is upon the cause and not the effect. Offensive animal matter in the presence of carbolic acid ceases to smell because it ceases to putrefy; the organisms of decay are destroyed, whereas the former drugs must be continued. Hence in so far as 'prevention is better than a cure,' carbolic acid and its combinations take first rank as disinfectants.

"As crude carbolic acid and commercial cresol are only slightly soluble in water, it is essential that one should know available and economical solvents or vehicles for its dilution and use. One of these in general use is common coal oil or kerosene; one pint of crude carbolic acid dissolved in one gallon of kerosene and used as a spray is a most effective mixture for the elimination of red mites, but it is too powerful a combination and too corrosive in its action to use on your birds, young or old, and even the strong fumes from the recent application to roosts and nests is far from beneficial. I do not consider kerosene a dilutant, but an accelerator used as a solvent for carbolic acid.

"Although carbolic acid does not readily mix with water, by the addition of potash or resin soap it will unite with water in all proportions, forming a milky emulsion.

"Not necessarily 'more uniform' in the 'making,' for it is by no means a difficult or complicated operation, but different lots of crude carbolic or cresol may and do vary greatly in strength and constituents, hence your finished home product will not always be a duplicate of the former 'batch.' But, after all, with a disinfectant for external use only, slight variations are no material handicap, and if you desire to make your own carbolic soap here's the how:

"Procure a pound tin of concentrated lye, 3 quarts of raw linseed oil and 2 gallons of crude carbolic acid. Dissolve the lye in a small quantity water, give it time to dissolve so as to use as little water as possible, and while you are waiting hunt up a five-gallon stone crock with a wide mouth and whittle out a stirring paddle. Pour the oil in the crock and very slowly add the lye solution, stirring constantly. Keep on stirring until you have a smooth liquid soap; then gradually add the acid, keeping your paddle on the move until the resulting liquid is a clear dark brown. This will mix in any proportion with water. Two or three tablespoonfuls to a gallon of water is about the strength for use with sprayer or brush for general disinfecting purposes. In disinfecting brooders, incubators and utensils that have been exposed to infection of any germ disease, twice the above quantity of 'soap' should be used.

"Carbolic Petroleums—Next to its importance as a disinfectant in liquid form, carbolic acid in the form of ointment offers the poultryman the greatest utility. The official carbolic acid ointment of the drug store is open to two objections; it contains 5 per cent of the pure acid, and hence is most too strong for general poultry purposes and the cost prohibits its free use.

"A five-pound tin of carbonized ointment is not an excessive amount for the average poultryman to have on hand; you should be able to buy 5 pounds of petroleum (cosmoline) for half a dollar, for the lower grades, unbleached, is far better for your purpose than the so-called 'refined.' Liquify it in a kettle over a gentle heat and add very gradually 5 liquid ounces of crude carbolic acid, stirring constantly. Remove from fire and continue stirring until cold and again semi-solid. Assuming that your crude acid did not exceed the grade known as 25 per cent, you can use this ointment freely on or about your fowls with no ill results and with great benefit. It should clean up scaly-leg, kill off the depluming mite, rid the chick of head lice and, rubbed into the vent-fluff, put to rout the body lice of hen and cock. It is also of use in chicken-pox to clean up the scabs and ulcers. And should you have a hen torn by the male, applied to the lacerated surface after the wound has been cleaned will prove a satisfactory healing salve. Aside from its own intrinsic value, this ointment offers a most desirable 'base' for the application of other desired drugs in ointment form.

"I frequently note lard recommended for a base for home-made salves. It is not good advice, for lard is by no means always free from disease germs, but even when sweet and sterile when first used, exposed to the air absorbs oxygen and becomes rancid. And rancid lard not only irritates the skin but may exercise injurious reactions on substances with which it is mixed. Petroleum being a mineral grease instead of an animal fat, is free from this menace of rancidity, and when carbolized offers not only an ideal sanitary but also an antiseptic base for all ointments or salves in which there is no ingredient incompatible with carbolic acid.

"If your carbolized petroleum does not give entire satisfaction as an insecticide, if any form of parasite survives its contact, you can easily reinforce its potency as follows:

"Free from all lumps and reduce to the finest powder one-half an ounce of flowers of sulphur and work it thoroughly into four ounces of your carbolic ointment.

"You can call this your 'sulpho-carbolate salve,' and I am very sure you will find it superior in results to the highly extolled sulpho-carbolate of zinc as a dressing for ulcerated tissue and membrane, and far easier to keep 'on hand' and apply.

Petroleum

"For many years now, except as an unknown constituent of certain patented 'oils' and liniments, crude petroleum is utilized only as a lubricant and in medicine has been superseded by paraffin oil and petroleum by-products of the distillation and refining of the crude petroleum in the production of gasoline and kerosene.

"You may be more familiar with petroleum as 'Cosmoline,' 'Vaseline,' or as 'Petroleum Jelly.' These are all one and the same product, but you usually have to pay something additional for the proprietary name and in buying it as 'petrolatum' you are pretty sure of obtaining an article of

American manufacture, by far the best for your purpose. In buying it in any considerable quantity, if you can have choice of several grades, select a No. 2 or No. 3 in preference to a No. 1, for they will cost you less and are far richer in medicinal value. I prefer a rather dark petrolatum with a greenish tinge to one of a golden yellow color and translucent.

"Under the head of 'Carbolic Acid,' I gave working formulas for a carbolized petroleum and a sulpho-carbol ointment, and also referred to the superiority of petrolatum over lard as a base for all ointments and salves. A few words in relation to the proper method of making an ointment may not be amiss:

"In incorporating a drug in powder form with a fatty base, first see that the powder contains no lumps or grit and place it in the center of your stone slab or plate glass and rub it up with a very small portion of the base until all the powder is taken up and continue adding the base a little at a time, following each addition with your spatula or knife to uniform consistency.

"Such simple directions may seem superfluous, but it has been my observation that the amateur invariably reverses this process, by placing the entire amount of petrolatum or lard on the slab, sifts the powdered drug over it and attempts to work it into a smooth and uniform mass, and rarely succeeds. If the drug to be incorporated is in the form of a liquid or oil, it is best to melt the petrolatum with a gentle heat and slowly stir in the liquid or oil and continue stirring until the mass thickens as it cools. Alcoholic extracts or oils are extremely difficult to accurately distribute through a fatty mass by any other method, but you must avoid having the petrolatum base hot; use only sufficient heat to liquify it, otherwise the heat may dissipate volatile principles it is important to retain.

"The petrolatum product that demands the most extended notice, not for its intrinsic value to poultrymen, but because of its frequent recommendation for almost every ill of chickendom, is the illuminant—

Kerosene or Coal Oil

"This product is so well known, as to its appearance, cost, production and distribution, that I shall avoid further mention along these lines. I can confine my discussion to its actual and assumed value to poultrymen as an insecticide, germicide and remedial agent extraordinary. Frankly, the only use for which I can recommend kerosene in poultry practice, save as "midnight oil" for study and account keeping, is as an insecticide for the destruction of the Red Mite that breeds and hides in the cracks and crannies of our poultry houses.

"The sole superiority of kerosene over other insecticides for this purpose lies in its penetrating and flowing qualities; it reaches the lowest nooks and tiniest crevices better than the heavier coal tar products. But owing to this same volatile characteristic and rapid evaporation, it should be remembered that kerosene is short-lived in its action. The application of today may not answer for the needs of tomorrow. To destroy mites, larva and eggs of this pestiferous parasite, there must be actual contact with the kerosene, the odor or fumes are not sufficient. Hence, an oil can and brush are better instruments for distribution than a sprayer, but should you conclude that the latter is more convenient, it will be well to add to each quart of kerosene, two ounces of crude carbolic acid.

"I cannot endorse the oft repeated advice of kerosene as a cure for roup, colds, catarrh and bronchitis, either by means of dipping the fowl's head into a bucket of water covered with a film of oil, the internal administration from a teaspoon, or by floating it on their drinking water. All these kindred ailments are distinguished by a more or less inflamed and congested condition of the mucous membrane of the head, throat, nasal passages and bronchial tubes. To effect a cure, it is necessary not only to kill the germs, but also to heal and restore to normal condition the diseased membrane.

"Kerosene is described as a 'powerful and dangerous irritant' to the cuticle and mucous membrane. How then can it also exert a soothing and healing action on said membrane? It is true that as a home remedy kero-

sene is sometimes successfully used as an external application to the throat and chest to allay internal inflammation and congestion, but in such cases it acts as a 'counter-irritant,' and it is only as a counter-irritant kerosene can be of service. But so long as we take any pride or satisfaction in our chickens wearing feathers, efficient counter-irritants are barred from poultry practice. Poultry editors probably have more inquiries regarding 'the loss of feathers than any other one form of 'trouble'; the answer may be vermin, depluming mites, favus, or feather-pulling, but the writer wonders if the too free resort to kerosene may not often be the correct explanation? I recall reading an inquiry for a remedy for the Texas flea, and the reply was as follows: 'Apply kerosene, full strength, freely to head of fowl; the oil won't hurt the fowl, but will kill the fleas.' But if the advice was followed, it's a safe bet that one Texas poultryman could exhibit a flock of bald headed chickens. And it must not be overlooked that any application powerful enough to cause the feathers to drop out must further irritate a cuticle already sensitive and sore from the parasite's ravages.

"Reverting to the kerosene treatment for roup, etc., I presume the theory is that it kills the germs of the disease; perhaps it does; but there are many drugs that will kill germs but only at the expense of a shock to the nervous system of the fowl or injury to the cuticle or mucous membrane that will take up much of the fowl's vitality to repair.

"I fear we are all a little daffy about germs anyway. We are told that there are both good and bad germs, but even the bad ones have too much self-respect to come when they have not been invited. What the industry needs is not more germicides, but less germ-allures. It's too late to go gunning for the germ that is in the sick chicken; its mission was accomplished ere we noted the symptoms. Wage vigorous war on the germs without, and if the good germs can't lick the bad ones within, it is because you haven't cultivated them or given them a chance to keep their powder dry.

Spirits or Oil of Turpentine

"Obtained by the distillation of resins from sundry species of southern pine and fir wood, seem to have no legitimate place in a letter devoted to petroleum products, but I hope to show that there is no inconsistency. In physical appearance, chemical composition and in their use and abuse as poultry remedies, there exists a close analogy between the spirits of turpentine and kerosene.

"The bulk of each is made up of the same volatile and inflammable hydro-carbons, and neither is soluble in water.

"Each when employed externally is readily absorbed by the unbroken skin, will quickly blister and destroy the plumage.

"Given internally are dangerous irritants to the mucous membrane, unduly stimulate the kidneys and in large doses cause purging and hemorrhage of bowels.

"I am not questioning but what both turpentine and coal oil may occasionally give good results, seemingly, but I do claim they are unnecessarily severe and cruel remedies, and that poultrymen can very well dispense with their services, as the good they can accomplish can be secured by other milder agents that carry no menace.

"I have known turpentine to be advised as an injection into the vent for bowel trouble and even administered to baby chicks in the same manner as a cure and preventive for this same 'white diarrhoea.' Did you, in your young and savage days, ever administer turpentine to the same part of a stray dog's anatomy? If so, you will recall that said dog needed all outdoors to express his opinion of turpentine so administered.

"I wonder by what peculiar process of reasoning those who advocate an enema of turpentine or any other drug as a means to make immune the baby or growing chicks from white diarrhoea, cholera and roup, refer to the treatment as 'inoculation'?

"It is very true that oil or spirits of turpentine has certain and accepted values in therapeutics. It is an excellent vermifuge, followed by castor oil, particularly for the expulsion of the tapeworm; it is frequently employed in low types of fever, as in certain stages of typhoid, and is occasionally used

as an enema in obstinate constipation and in the accumulation of gas in the bowels. By this seeming endorsement of its use with poultry, it must be noted that turpentine so employed is always in the form of an emulsion or its irritating qualities modified by bland oils or mucilaginous mixtures. And such preparation is far from practical in poultry practice.

Acids

"Of the more than 500 acids recognized by chemistry and pharmacy, but very few are of utility to poultrymen, save as exhibited in their 'salts' or as one or more of the constituents of the natural or artificial 'ration gathered by or provided for the birds.

"And right here I want to go on record that, although I write of drugs, I protest against continual or unnecessary 'drugging.' If your flock is well-bred, well-fed, well-watered, well-housed—given room, range and kindly treatment—you should have but rare occasion for any drug or remedy.

"'Prevention is better than cure,' but mark this—intelligent and worthwhile prevention lies in the observance of the preceding paragraph and not in the drugging or in the inoculation of perfectly well and normal chicks or chickens.

"Drugs are only a necessary evil, as drugs; it is far better for the vitality and productiveness of your flock that they obtain the minerals, salts and acids their economy demands from Nature's laboratory in field, forest and stream, than from the druggist's shelves or proprietary preparations.

"And when 'shut-in,' keep in mind that not only must the grain, grit, shell, meat and greens be ample in quantity, good in quality, but of sufficient *variety* to furnish *all* the elements required to maintain health and vigor. Although the poultryman in his work and attendance has need of but few of the many acids, it is wise for him to know something of those with which we are all more or less familiar and those most frequently referred to in the poultry press.

'*Boric Acid*.—Fifteen grains dissolved in an ounce of water makes an excellent wash for cleaning out the mouth and nostrils of the fowl afflicted with catarrhal accumulations. I referred to this acid under Soda, and stated that its therapeutic value was identical with Borax.

'*Salicylic Acid*.—There exists a group of organic or vegetable acids that doubtless at times the fowl's organism demands a modicum of, that we can best administer by giving them the run of the orchard and garden or throwing them waste from our tables. It would be absurd for me to recommend the feeding of fruits at regular intervals, and too often offering of them to the penned birds would be unwise, but I am satisfied that an occasional acid fruit or berry is not only relished, but craved by the confined birds.

"It is easily demonstrated that fallen fruit and reachable berries form a portion of their ration on free range.

'*Phosphoric Acid*.—Bone meal and granulated bone, add libitum and freshly ground, untainted green bone, in moderation, afford the fowl this necessary product to growth and upkeep.

'*Wood Tar*.—Also obtained in the destructive distillation above referred to, is a semi-fluid dark brown or black substance, strong, pungent odor and sharp taste, officially known as Pix Liquidate. It has considerable medicinal value, being valuable as a dressing in scaly skin diseases and much employed in combination with other oils and syrups as an expectorant in sub-acute and chronic bronchitis.

"Visiting a poultryman friend one day last summer, in the course of our talk, he remarked: 'I was much interested in what you wrote in the A. P. J. about the use and abuse of Permanganate of Potash. I won't say but what you and Dr. Woods are right, but if you are right, there are many, many others that are wrong. You know I have a healthy bunch of birds, but during the late fall rains a few invariably 'catch cold' and I have never given them anything but Permanganate; give them a house to themselves and dissolve the P. P. in their drinking water until it is rich wine color. It cures 'em. Now the question is, if you have me throw away this potash, what can you offer me to take its place?'

"My reply was that I was inclined to think his naturally healthy birds, isolated and confined from the inclement weather in a dry, roomy, sunshiny (when the sun did shine), and well ventilated house, would have quickly recovered from their colds without any medicated water, but if in the future, to ease his mind of the feeling that he ought to give them something and cater to his desire to give that something in the water to save the labor of individual treatment, I would recommend that he make and give them 'tar water' on alternate days, after a purgative dose of Epsom salts in their mash the first day of isolation and confinement.

"And in case any care to try the substitution, I will state that tar water is made by adding one pint of tar to four pints of water and shaking vigorously during twenty-four hours. Pour off the liquid and strain or filter. For poultry use, to each pint of the tar water you may add four pints of pure water. Its medicinal properties are similar to turpentine, but very much irritant. It also acts as a stimulant and diuretic. For acute and even chronic catarrhal conditions it is an excellent home poultry remedy. Water takes up from the tar, in addition to other constituents, a small portion of creosote and Acetic Acid.

"*Lactic Acid*.—An organic acid usually obtained by subjecting milk or grape sugar to lactic fermentation. It is formed whenever sugar in solution is placed in contact with an alkaline or earthy carbonate in presence of a special ferment, as, for example, the casein of milk or cheese; hence it is evolved in the souring of milk, so in the feeding of sour milk, curd or buttermilk to the flock, the poultryman is availing himself of the cheapest, most convenient and desirable form in which to administer lactic acid.

"True it is that certain manufacturing chemists offer in tablet form cultures of imported bacterium bulgaricum, which, dissolved in sweet milk, produces a milk much higher in acidity than our domestic lactic acid bacteria, but the greater acidity is more than counterbalanced by the increased cost, prohibitive of profit if you are employing soured milk for its nutritive as well as remedial value.

"For two or three years past the feeding of milk, sweet, sour, whey, curd and buttermilk, has occupied much space in the poultry press and many extravagant claims have been filed to the effect that, in addition to taking the place of meat in the ration, it is a cure and preventive of the greatly dreaded and much advertised White Diarrhoea in baby chicks.

"It is in the interest of the great poultry industry that the individual poultryman ceases to be continually on the lookout for the appearance of these fatal germ diseases, but constantly and intelligently on the look-in for conditions of housing, sanitation and improper diet that are responsible for the catarrhal colds of the adult birds and the abnormal droppings of the baby chicks that he mistakenly diagnoses as Roup or White Diarrhoea.

"The State Experimental Stations are trying for, and doubtless in good time will secure a 'strangle-hold' on these obnoxious germs, and when they do, we will all doubtless be invited to the obsequies. And finally, brethren, in bringing this article to a close, just a word of caution in the feeding of sour milk:

"Fermenting sour milk is capable of forming an intoxicating drink; keep your receptacles clean and don't use tomorrow what was left over from today. And if you are of those who keep the pink tea of Permanganate before the flock, cut it out the days you feed sour milk, for lactic acid of sour milk produces in contact with the Permanganate of Potash, acetic aldehyde, a powerful and poisonous alcohol.

Oils

"For practical purposes of care and treatment of poultry, I would divide the oils into simply two classes: Those valuable for external use only, and those advisable for internal administration. And simply as oils, I find it unnecessary to comment on but few in each class. The essential oils are so denominated because they possess in a concentrated state the properties of the plants from which they are obtained. Oils are not only insoluble in water but too concentrated and too pungent for distribution in the mash.

Alcoholic tinctures of the plants of virulency and the plant itself, if innocuous, are more practical vehicles for medicating our fowls than the expressed or distilled oils.

"This is in accord with a principle that if I can thoroughly fix in your mind and establish in your practice, I will have done you more real service than in all my other 'recommendations,' namely, when in your judgment your birds stand in need of certain elements, mineral or vegetable or animal, acid or alkaline, laxative or astringent, and you can afford them the indicated medication through careful selection in the rations of greens, grain and mash, you should do so in preference to resorting to laboratory products.

"As I have already intimated, not having a great deal to offer on the subject of oils, I shall add a few lines in regard to the use and value of mustard seed and flaxseed meals. This, however, is far from foreign to a chapter on oils, for the fixed or fatty oils of vegetable origin are furnished us almost exclusively by the fruit and mainly by the seed, and the employment of the meals or ground mustard and flaxseed, instead of the expressed oils, follows the principle above outlined.

"Oils for external use:

"Cotton seed oil, not necessarily for 'external use only,' as you may now have it on your table labeled 'olive oil,' but placed under this classification here, as I desire to recommend it as an economical, bland, innocuous base and dilutant for more active remedial agents.

"Dissolve two ounces of gum camphor in eight ounces of cotton seed oil for the oft recommended camphorated oil; sprayed into the nasal cavities and throat, it is an excellent remedy for catarrhal conditions. Good as a dressing for frozen combs and wattles, and will clean up scaly legs unless treatment has been too long delayed.

"Oils for internal administration:

"Leaving out of question food values, and referring only to medicinal use, under the above classification I can restrict my comments to one oil that in my opinion deserves to be designated as 'first aid' in acute disorders, namely,

"*Oleum ricini or castor oil*: Obtained from the seeds of *Ricinus communis*, native of the East Indies and northern Africa, but cultivated throughout the Middle and Western states, both for oil production and for its ornamental value. The action of the oil as a cathartic is mild, speedy and thorough; stimulates the liver, allays irritation and inflammation of the intestines and lubricates the tissues.

"Intestinal disorders, save in the instance of that rare disease, chicken cholera, are individual ailments and not flock infection, hence should command individual treatment:—a teaspoonful of castor oil poured down the throat of the ailing bird is preferable and far more certain in its action than a purgative given through the medium of the mash or water. Diseases of the liver, limber-neck, diarrhoea, indigestion and enteritis, are all due, in a great measure, to the absorption of poisons in the intestines arising from indurated faeces and acrid accumulations. So in treating these 'ills' it follows that the 'first aid' should be a thorough examination of the bowels; in many cases no further medication is necessary.

"In administering castor oil, slightly warm the oil or have the spoon hot and the oil will not cling to the spoon or the bird's esophagus. And this is not a bad tip for family use.

"It is of little moment if you use none of my given formulas and soon forget, as you doubtless will, what I have offered regarding the several drugs treated, if you will but approve and adopt certain rules I have endeavored to emphasize, and a few of which I desire to repeat in closing:

"Shun poisonous drugs and compounds and avoid cruel treatments.

"Know what you are giving or using, and why.

"Remember that no drug or remedy can give you good results without the co-operation of care and cleanliness.

"Keep in mind that fresh air, sunshine and whitewash can keep down your outlay for disinfectants and germicides.

"Remember that healthy, well-fed fowls require no stimulants and that spicy condiments are only valuable in adding an appetizing flavor to a mash that's grown monotonous.

"Remember that fresh, clean and abundant water is preferred by your birds to pink tea or doped drink and in nine cases out of ten is better medicine.

"Forget not that first aid to sickly bird or ailing flock means a general and thorough cleaning up and down and food inspection.

"And finally, brethren, when 'doctoring' your fowls, if in doubt, give them or use on or about them nothing you would hesitate to take or use on yourself or in your family for like ills and injuries.

"This I call the poultry practitioner's Golden Rule."

CHART OF DISEASES AND SYMPTOMS

Simple diagnosis of the most common poultry diseases:

Bronchitis:—Difficult breathing, wheezing, rattling or bubbling sound. Mucous in mouth or throat.

Bumble Foot:—Swelling about the toes and feet. Often lameness.

Break Down:—Abdomen large and baggy. Crowded with fat and hangs down.

Black Head (Turkeys):—Head dark. Victim mopes, loss of appetite, wings dropped. Diarrhoea. There are no special external symptoms until the advanced stages of the disease. If the birds are losing in weight, look on them as suspicious cases.

Colds:—Watery discharge from eyes and nostrils.

Catarrh:—Mucous in nostrils. Offensive odor about the head.

Chicken Pox:—Comb and face covered with warts, sores and scabs.

Croup:—Difficulty in breathing. Coughing accompanied by wheezing or rattling. In severe cases birds become sleepy. Refuse to eat. Wings droop. Temperature high.

Canker:—White cheesy patches on tongue, mouth or throat. Coughing and difficulty in breathing if canker is in the trachea.

Cholera:—Deep yellowish diarrhoea, finally changing to greenish. Feathers rough, head drawn down towards the body and wings droop. Sleepy appearance. Frequent discharges. Instant thirst.

Crop Bound:—The crop is enlarged and prominent, and seems filled with food.

Congestion of Lungs:—Difficult rapid breathing, sleepiness and indisposition to move. Comb dark.

Congestion of Brain:—Spasmodic and nervous. Head drawn back and loss of control of head and neck muscles. In acute stages they become more quiet.

Diarrhoea:—Their droppings, either whitish, yellowish, greenish or brownish, sometimes have an offensive odor.

Enteritis:—Severe form of diarrhoea. Bird is inactive and dumpish. Comb is first pale and limp and later becomes dark. Bird is sleepy and unwilling to walk. Distention of the abdomen.

Egg Bound:—Frequent visits to nests. Hen strains and appears to be in distress. Stands more or less erect.

Eversion of Oviduct:—The oviduct and a mass of red and bloody tissues projecting from the vent.

Gapes (Young Chicks):—Frequent gaping, coughing and sneezing. Dumpish, weak, and drooped wings. Eyes closed, mouth opened and tongue protruding.

Going Light:—Bird gradually grows thinner and becomes practically skin, bones and feathers. Comb pale and withered.

Internal Worms:—Evidence of indigestion. Comb is pale. Diarrhoea or constipation. Birds become thin and lifeless.

Inflammation of Crop:—Crop filled with liquid and gas. Contents sour. Bird is dull, loses its appetite and shows weakness.

Limber Neck:—Control of neck muscles is lost. Neck hangs limp so the head falls toward ground between the feet.

Leg Weakness:—Unsteady walk. Will sit while eating. Often unable to stand alone and constantly tumbling over.

Liver Disease:—Rough plumage, watery diarrhoea, brown or yellow, lack of appetite, sluggish, comb first purple, then dark, and finally black.

Peritonitis:—High fever, stupor, glaring or bright eyes, distended abdomen, frequent discharges from the vent, indisposed to move.

Ovarian or Oviduct:—Act as if broken down in back and a tendency to sit down. High fever. Glaring eye and sometimes have quivering motion. Seem in great distress. Rapid breathing. Discharge from vent resembling yolk of egg.

Pneumonia:—Attack sudden. High temperature. Rapid and difficult breathing. Coughing and many have a mucous dropping from the mouth and nostrils. Rough plumage. Drooping wings. Loss of appetite. Thirst and constipation.

Rheumatisms:—Lameness or stiffness. Staggering motion and objection to moving. Sometimes swelling joints.

Roup:—Sticky, yellowish discharge from eyes and nostrils. Offensive odor about head. Eyes and face sometimes swollen. Loss of appetite. Results in general rundown appearance.

Sore Head:—Comb and face affected with sores, warts or scabs.

Scaly Leg:—Scales on legs, rough, raised and unsightly. In many cases scales have disappeared entirely.

Tuberculosis:—Emaciation. Pale comb and wattles. Weakness. Lameness. Ruffling of feathers and in last stages diarrhoea. Bright eye and ravenous appetite.

Vent Gleet:—Straining and frequent passages of excrement voided in small quantities. Vent swollen and irritated. Discharge collects on the skin. Sores and ulcers form. An offensive odor.

White Diarrhoea (Young Chicks):—Crop empty. Chicks sleepy and lifeless. Remain under hover or hen. Wings droop. No appetite. White discharge from vent. Shrill cry as if in pain. Short backed and big bellied.

Wry Neck:—Head drawn backwards. Nervous and spasmodic. No control of head or neck muscles.

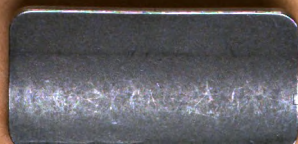
QUESTIONS LESSON 27

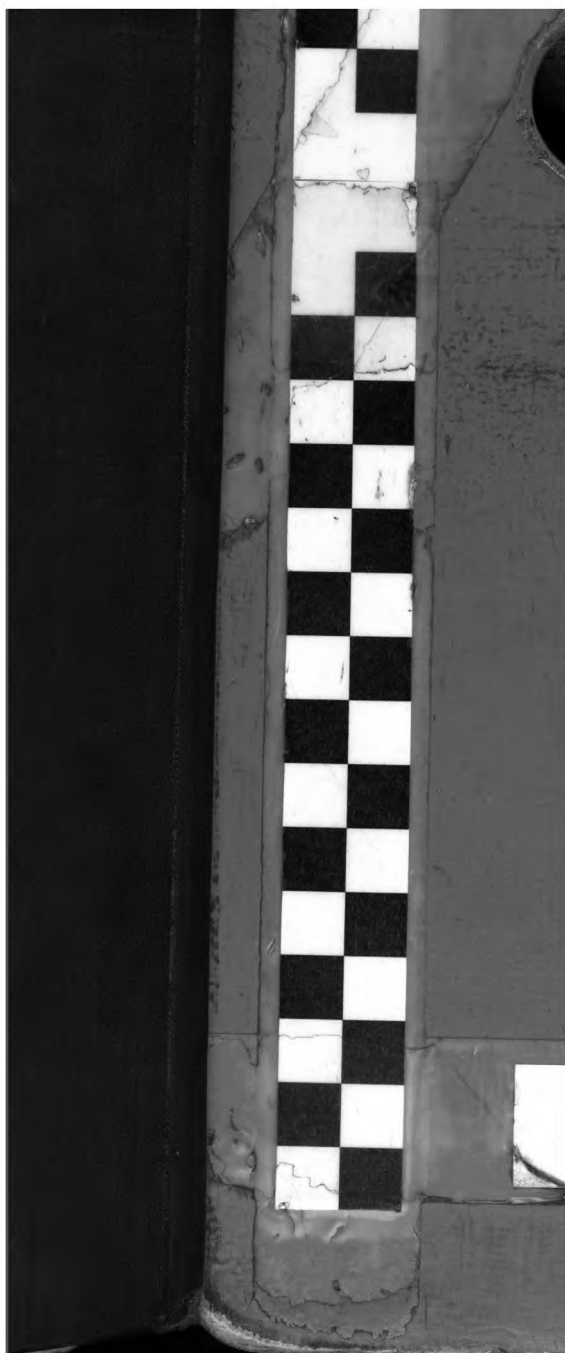
POULTRY DISEASES, THEIR CAUSE, PREVENTION AND CURE

1. Why is the liver said to be a filter for the blood?
2. What, in your opinion, is the best treatment for roup?
3. What should be done in cases of tuberculosis or cholera?
4. What is the best remedy for canker?
5. How would you treat a case of severe crop bound?
6. What two symptoms would you look for in liver trouble? And name a treatment for liver trouble.
7. What is "Going Light"?
8. What is the difference between "limber neck" and wry neck?
9. How would you detect vent gleet and what is the best treatment?
10. Name two simple drugs usually found among home remedies which are useful in treatment of poultry diseases, and give uses for each.

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